

Nutrition Care *of the* Older Adult

A Handbook for Dietetics Professionals Working
Throughout the Continuum of Care



Consultant Dietitians in Health Care Facilities
Dietetic Practice Group
THE AMERICAN DIETETIC ASSOCIATION



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Nutrition Care of the Older Adult

A HANDBOOK FOR DIETETICS PROFESSIONALS WORKING THROUGHOUT THE CONTINUUM OF CARE

Kathleen C. Niedert, MBA, RD, FADA, Editor

Becky Dorner, RD, Clara Gerwick, RD, Mary Ellen Posthauer, RD,
and Carol Sichterman, RD, Associate Editors

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10 9 8 7 6 5 4 3 2 1

CONTENTS

Foreword vii

Preface viii

Contributors ix

1 Health Care in Transition 1

Challenges and Opportunities 1
The Changing Marketplace 2
What Is Managed Care? 3
Documenting Outcomes 9
Opportunities for Success 10

2 Continuum of Care and Services 13

Institutional-based Services 13
Housing 13
Integrated Care Networks 14
Care Settings 15
The Dietetics Professional's Role 16
Community-based Health Care 16
Home Care 17
Older Adults in Correctional Facilities 18
Future Directions 18

3 Standards of Practice for the Consultant Dietitian 21

Core Competencies for Entry-level Dietitians 21
Competency Statements for Emphasis Areas 22
The ADA Code of Ethics for the Profession of Dietetics 25
The ADA Standards of Practice for Dietetics Professionals 26
Liability and Malpractice 29
How Can You Avoid Liability? 31
Should You Have Insurance? 32

4 Performance Improvement and Outcomes Management 33

Positioning Nutrition Services in Today's Health Care Environment 33
Outcomes Management 33
Types of Outcomes 33
Implementing Outcomes Management 37
Performance Management 37

Impact of Accrediting Organizations on Quality	38
Performance Measurement	39
Types of Indicators	39
Performance Measurement: A National Tool	41
Quality Tools	41
Summary	46

5 Quality of Life 49

The Eden Alternative	49
Omnibus Budget Reconciliation Act	49
Home Care	49
Liberalizing Approaches to Diet Modification	50
Feeding the Terminally Ill	51
Clients' Rights and Responsibilities Related to Nutrition Care	51
The Registered Dietitian's Responsibilities Related to Client Care	52
Summary	53

6 Relationships Between Nutrition and Disease 55

Interventions in Malnutrition-Related Causes of Disabilities	55
Obesity	55
Diabetes Mellitus	56
Hypertension	57
Hyperlipidemia	58
Osteoporosis	59
Chronic Obstructive Pulmonary Disease	60
Cancers	61
Renal Disease	61
Hepatic Disease	62
Immune System Disease	63
Dementia	64

7 Risk Factors Associated with Poor Nutritional Status 67

Nutritional Risk Factors	67
Inappropriate Food Intake	67
Poverty	68
Social Isolation	69
Physical Inactivity or Impaired Functional Status	69
Selected Acute and/or Chronic Diseases or Conditions	69
Alcohol Abuse	70
Constipation	71
Depression	71
Oral Health Problems	72
Sensory Impairment	73
Chronic or Inappropriate Use of Medications	73
Summary	73

8 Laboratory Assessment of Nutritional Status 77

- Implications of Selected Laboratory Tests 77
- Considerations for Requesting Laboratory Tests 78
- Clinical Laboratory Values 79
- Case Studies 94

9 Drug-Nutrient Interactions 99

- Defining Drug-Nutrient Interactions 99
- Drug-Nutrient Adverse Side Effects 99
- Drug-Nutrient Interactions 99
- Position of The American Dietetic Association:
 - Vitamin and Mineral Supplementation 99
- Drug-Nutrient Interactions and the Older Adult 99
- Enteral Feedings and Drug-Nutrient Interactions 102
- Alcohol 103
- Highly Protein Bound 105
- Pressor Amines 105
- Caffeine 105
- Grapefruit Juice 105
- Alternative Therapies 105
- Regulatory Compliance 108

10 Nutrition Considerations in Renal Disease 123

- Nutrition Risks in Renal Disease 123
- Additional Nutrition Interventions for Specific Stages of Renal Disease 126
- Additional Considerations 127
- Understanding Renal Labs 128
- Case Study 130

11 Enteral and Parenteral Nutrition Support 133

- Enteral Nutrition Support 133
- Parenteral Nutrition Support 139
- Summary 144

12 Managing the Client with Compromised Pulmonary Function 153

- Malnutrition 153
- Nutrition Assessment 158
- Nutrition/Chemical Dynamics 161
- Nutrition/Respiratory Quotient Relationships 161
- Nutrition Considerations in Ventilator-Dependent Clients 162
- Nutrition Needs in Respiratory Clients 162
- Nutrition Screening 163
- Summary 163

13 Skin Integrity 165

Skin Conditions 165

Summary 170

14 Nutrition Assessment 175

Client Nutrition Screening 175

The Nutrition Assessment 175

Standard Measures 195

Kilocalorie Needs 205

Protein Requirements 205

Fluid Requirements 206

Laboratory Values 206

Medications 206

Summary 206

15 Rehabilitating the Eating-Disabled Client 209

Quality of Life 209

Autonomy 210

Special Dimensions of Extended Care and Assisted Living Facilities 210

Positioning 211

Dysphagia 212

Rehabilitation 214

Summary 215

16 Care Planning/Discharge Planning 217

Acute/Subacute Setting 217

Extended Care 217

Home Health Care 218

Resident Assessment Instrument 218

Minimum Data Set 219

Triggers 219

Discharge Planning 222

Computer Programs 222

Summary 223

Appendix 1. Common Medical Abbreviations 229

Appendix 2. Documentation Guidelines 234

Appendix 3. Commonly Prescribed Drugs
and Over-the-Counter Medications 235

Index 249

FOREWORD

The aging of Americans has been a popular subject in the media for the past several years, as analysts have examined its effect on Social Security, Medicare, and retirement-friendly states. The “graying of America” also affects the dietetic professional. Almost all practicing dietitians and dietetic technicians have or will have older adults in their practices. Therefore, a knowledge of nutrition that includes the unique needs of the older adult throughout the continuum of care is important.

This revision of what was *Nutrition Care in Nursing Facilities* includes the most up-to-date information on the nutrition care of the older adult. It explores general physiological changes and focuses on common maladies of the older adult, many of which can be addressed through an improved nutritional status. Assessment components and care planning are also explored as they relate to the older adult in an extended care facility.

The editors and authors of this book are members of the Consultant Dietitians in Health Care Facilities (CD-HCF) dietetic practice group. Collectively, they have over 100 years of experience in the care of older adults in various settings. This collective experience has resulted in a scientifically sound and practical manual.

In whatever setting you practice, this manual should be a valuable reference. Studies have repeatedly shown that nutrition intervention can save money, including Medicare funds. Having an understanding of nutrition issues across the continuum is critical in influencing the health care system and demonstrating quality outcomes.

Jody L. Vogelzang, MS, RD, FADA

Chair, 1998-1999

Consultant Dietitians in Health Care Facilities

Dietetic Practice Group of The American Dietetic Association

PREFACE

We tend to think of older adults as being the primary users of nursing facilities. But changes in health care delivery have led to the development of home health agencies and assisted living, as well as the continued need for facilities handling conditions such as cognitive dysfunction, spinal cord injury, and illnesses and accidents requiring subacute or rehabilitative services. As a result, a wide range of clients with varying needs and living environments presents new challenges and opportunities to the dietetics professional.

When The American Dietetic Association (ADA) asked our practice group, Consultant Dietitians in Health Care Facilities (CD-HCF), to revise the 1992 *Nutrition Care in Nursing Facilities*, we agreed with enthusiasm. As we began to review the previous two editions, we marveled at how the practice of medical nutrition therapy had changed since 1987, when Anna Katherine Jernigan, MS, RD, had the vision to write a handbook for the practitioner in long-term care facilities, and how it has continued to progress in the years since publication of the second edition. To reflect these changes, a new name, *Nutrition Care of the Older Adult: A Handbook for Dietetics Professionals Working Throughout the Continuum of Care*, was chosen.

The dietetics professional must provide a high level of medical nutrition therapy for members of this client population: assessing nutrition needs, developing goals for the clients, directing the implementation of the nutrition plan to meet those goals, documenting relevant data, and evaluating results. This book was developed to provide dietetics professionals with up-to-date, useful material for assessing clients in this new health care environment. It is not intended to be all-inclusive, but to provide some guidance to the dietetics professional. As always, information set forth in this book should be reviewed in light of new research findings as they become available.

To meet the goal of completing this revision, the editorial committee was blessed to have the previous editor, Clara Gerwick, RD, as a member, as well as previous associate editor Mary Ellen Posthauer, RD. New members of the editorial committee included Becky Dorner, RD, and Carol Sichterman, RD. These extremely busy professionals found time not only to edit the contributions of others, but to write numerous sections as well.

Other professionals within our field as well as experts outside the dietetics profession were called on to provide additional information the committee deemed necessary to make this publication what it is today. We are grateful to them for sharing their expertise. We are also indebted to the reviewers who took the time to thoughtfully critique the content. I personally want to thank Marla Carlson, a long-time friend and great office manager, who did all the word processing, made hundreds of calls, conducted Internet searches, and did countless other "little" things, all of which contributed to the final product. Finally, a special thanks to all our families who put up with midnight phone calls, weekends of microwaved meals, and numerous other inconveniences so we could meet our deadlines.

Proper nutrition care is crucial for all our clients. Our goal was to provide the dietetics professional with a resource that could be used across the continuum of care. *Nutrition Care of the Older Adult* has been developed to supplement other texts and references. We urge our readers to accept the challenge to meet the nutrition needs of the client and provide excellent, quality care for all those served.

Kathleen C. Niedert, MBA, RD, FADA

CONTRIBUTORS

Editor

Kathleen C. Niedert, MBA, RD, FADA
President, Omega Health Associates
Hudson, Iowa

Associate Editors

Becky Dorner, RD
President, Becky Dorner and Associates
Akron, Ohio

Clara Gerwick, RD
CL Gerwick and Associates, Inc
Overland Park, Kansas

Mary Ellen Posthauer, RD
President, MEP Healthcare Services, Inc
Evansville, Indiana

Carol Sichterman, RD
Dietary Consultant Services
Kentwood, Michigan

Contributing Authors

Luray C. Bucko, MS, RD
Consultant Dietitian
CL Gerwick and Associates, Wichita Office
Derby, Kansas

Pam Charney, MS, RD, CNSD
Clinical Nutrition Manager/Nutrition Specialist
University of Chicago Hospitals
Chicago, Illinois

Audrey Tittle Cross, PhD, JD
Associate Clinical Professor
Institute of Human Nutrition & School
of Public Health
Columbia University
New York, New York

Robert S. DeChicco, MS, RD, CNSD
Nutrition Support Dietitian
Cleveland Clinic Foundation
Cleveland, Ohio

Johanna Dwyer, DSc, RD
Director, Francis Stern Nutrition Center
Professor of Medicine (Nutrition) and Professor
of Community Health, Tufts University
Medical School
Professor of Nutrition, Tufts University School
of Nutrition
Senior Scientist, Jean Mayer USDA Human Nutrition
Research Center on Aging at Tufts University
Boston, Massachusetts

Quincey Grounds, RD, CNSD
Nutrition Support Dietitian
Vencor Hospital
Dallas, Texas

Cindy Hamilton, MS, RD, CNSD
Nutrition Support Dietitian
Cleveland Clinic Foundation
Cleveland, Ohio

Linda Hopper, RD
Renal Dietitian
North Iowa Mercy Dialysis Center
Mason City, Iowa

Amy E. Inman-Felton, RD, CNSD
Quality Nutrition Services
Leawood, Kansas

Mary D. Litchford, PhD, RD
Manager, Training and Development
Continental Management Consultants
Greensboro, North Carolina

Laura E. Malterese, MS, RD, CNSD, FADA
Manager of Nutrition Support Dietitians
Cleveland Clinic Foundation
Cleveland, Ohio

Renee Piazza-Barnett, MEd, RD, CNSD
Nutrition Support Dietitians
Cleveland Clinic Foundation
Cleveland, Ohio

Brenda Richardson, RD
Corporate Nutritional Services Manager
Vencor, Inc
Louisville, Kentucky

Gretchen E. Robinson, MS, RD, FADA
Corporate Dietitian
HCF Inc
Lima, Ohio

Margaret Roche-Dudek, MS, RD, FADA
Kathleen Roche-Klemma, RD
Roche Dietitians, LLC
Riverside, Illinois

Carlene Russell, MS, RD, FADA
Consultant Dietitian
North Iowa Mercy Medical Center
Mason City, Iowa

Jane V. White, PhD, RD
Department of Family Medicine
University of Tennessee College of Medicine
Knoxville, Tennessee

Reviewers

Lisa Fieber, MS, RD
Health Information Services, Inc
Fairfield, Illinois

Charlette R. Gallagher-Allred, PhD, RD
Manager of Geriatrics and Long-Term Care
Ross Products Division of Abbott Laboratories, Inc
Columbus, Ohio

Betty Leif, RD
Director of Food and Nutrition Services
Sunrise Care Center
Milwaukee, Wisconsin

William J. Niedert, RRT
American Home Patient, Inc
Waterloo, Iowa

Carlene Russell, MS, RD, FADA
Consultant Dietitian
North Iowa Mercy Medical Center
Mason City, Iowa

1 CHAPTER

Health Care in Transition

At a time when health care is in transition, the registered dietitian (RD)/dietetic technician, registered (DTR) must be in a position to make informed choices on appropriate medical care, understand the specifics of medical nutrition therapy (MNT), and have a broad picture of the forces shaping health care delivery. Uncertainty about the consequences of this important reform will be resolved in a dramatically changing marketplace.

The 1997 Balanced Budget Act contained two dramatic changes which shape the management of extended care facilities for the next decade¹:

1. "Consolidated billing" (more accurately, consolidated payment) requires that all payments for products and services provided under Medicare to clients in skilled nursing facilities (SNF), or facilities that include SNF beds, must be made to the SNF. The law bars payment to any other entity.
2. The law also requires that the Health Care Financing Administration (HCFA) set up a "Prospective Payment System" (PPS) for skilled nursing facilities. PPS will provide a single payment to a SNF which will cover both Medicare Part A and Part B services provided to clients during their Part A stay.

Basic fundamentals for the program require that SNFs are responsible for billing for Part B services provided by outside suppliers (ie, enteral and urological products) and physical, occupational, and speech therapies.

Consolidated nursing facilities billing and prospective payment has created new challenges and opportunities for risktakers, dealmakers, and network builders. The market has become very competitive. To remain an active participant in this new market, the RD must be more involved in Part B documentation. RDs should advise and make product selection decisions for specific clients based on financial analysis. Both PPS and consolidated payment increase control by facility managers and administrators. In turn, the RD can enhance his or her value to the extended care facility by understanding and working for the SNF on enteral claims documentation.

The winners will answer one question: "What do customers need in the new environment?"

CHALLENGES AND OPPORTUNITIES

All health care providers face both challenges and opportunities in the current and future health care environment. *Box 1* lists essential steps to meet the challenges and take advantage of the opportunities.²

BOX 1:

Basic Steps for Participants in All Health Care Programs in a Changing Climate

1. Identify the challenges and opportunities.
2. Appreciate common goals and objectives.
3. Recognize the need for change.
4. Identify obstacles to change and improvement.
5. Appreciate the common objectives.
6. Identify elements for optimum performance and service.
7. Implement ways to meet challenges and make the most of opportunities.

In this era of change, health care reform means changing attitudes, systems, and processes, not just restructuring reimbursement and improving access. Tomorrow's health care demands **quality** and **cost-effectiveness**, not just one or the other. Expectations for quality services increase while reimbursement tightens. Future care systems focus on providers who cooperate through networks and alliances. Fee-for-service reimbursement is challenged by alternatives offering different incentives. Capitation and managed care shift care objectives from providing service which maximizes reimbursement to delivering services at the lowest possible cost, for the shortest time, and in the least restrictive setting.³ Practitioners and providers need to develop and utilize practice standards, guidelines, and protocols. The use of objective measurements and realistic comparisons between providers and practitioners justifies client outcomes.

THE CHANGING MARKETPLACE

Health care providers face unprecedented opportunities to apply knowledge and skills which improve clients' quality of life. The continuum of care in the United States is an evolving, changing dynamic of institutional- and community-based services that range from high-tech subacute services to home care, day care, respite care,

assisted living, retirement communities, and traditional extended care facilities.³ This market is a moving target that shifts direction depending on a variety of factors. Clients do not move neatly along this mythical continuum where services are arranged in a staged linear fashion. Instead, individuals move in and out, back and forth, receiving care from

Factors Influencing Market Shifts

- Competitive marketplace
- National economic policy
- Payment mechanisms
- Geographic factors
- State and legal political climates

providers throughout the continuum in no uniform order. The question here is not where the market will go but how to succeed in a changing market. *Figures 1 and 2* show the evolving shifts in the continuum of care.⁴

As cost containment becomes imperative, more pressure is placed on hospitals, physicians, and other ancillary services to manage costs and to provide more innovative methods of health care delivery.⁵ The traditional fee-for-service philosophy that more is better (the sicker the client, the more services provided, the more investment made) has been replaced by the philosophy of prevention and aligning financial incentives with health.

Figure 1
Interim Continuum of Care

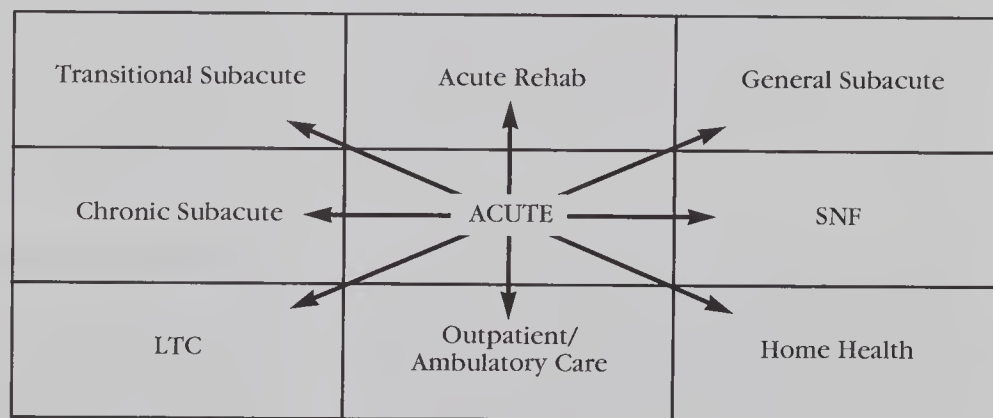
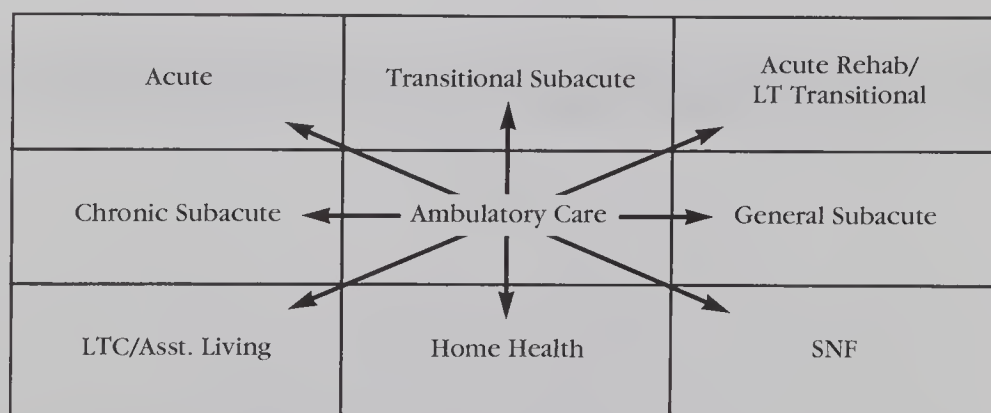


Figure 2
New Continuum of Care



BOX 2: Health Care Customers and Decision Makers**Customers**

General Public
 Corporations
 Small and Large Businesses
 City/County/State Services
 Managed Care and Home Health Care Agencies
 Health Insurance Companies
 Health Professionals
 Athletic/Sports Industry
 Restaurant Industry, Food Manufacturers,
 Grocery Industry
 Politicians (at all levels)
 Media (including on-line)

Decision Makers

Individuals
 CEO, HR Directors
 Benefits Managers
 HR Directors, Wellness/Nutrition Practitioners, Physicians or
 Registered Nurse
 Protocol Writers
 Individual Groups
 Coaches, Trainers, Athletic Managers, Physicians
 American Culinary Federation, CEOs and Presidents,
 Quality Control Departments, Sales and Marketing
 Professionals
 Aides and Staff Assistants
 Reporters, Programmers, and Producers

Moving into the managed care arena presents both a danger and an opportunity for the RD. The RD must do the right things now to align with the right players or his or her practice could be affected detrimentally. Conversely, managed care presents enormous opportunities for the RD to become one of the most prominent players in the prevention area.

In the managed care market the customer is central to the process. But, who exactly is the customer in this revamped system . . . the consumer, the government, the insurance company, or the third party payers?⁵ Box 2 lists customers and decision makers in this new market.

As consumers demand more information and services, and as Congress looks for ways to curb the costs

of health care, the stakes have never been higher for the establishment of MNT as a critical service in all health care settings.

WHAT IS MANAGED CARE?

Managed care is part of an evolving movement to organize the nation's health delivery system. It represents the organization, management, and financing of health care services. Managed care encourages better case management. It challenges traditional practices and procedures to create incentives to replace costly institutional services with cost-effective alternatives (see Figure 3).⁵ Goals for managed care organizations (MCOs) include enhancing value and expanding provider networks.

Figure 3**Paradigm Shift at the Health Industry Level Caused by Managed Care****From**

Illness/Curative Model
 Tracking Beds Admits
 Service Earns Money
 Fee for Service
 Competition Among Providers
 in Specialized Areas
 Fragmented Care

To

Wellness/Preventative Model
 Tracking Outcomes/Health Status
 Service Costs Money
 Capitation
 Mergers/Alliance to Provide Care
 throughout Life Span
 Smooth Care Across the Continuum

As diagrammed in *Figure 4*, managed care is an umbrella category that includes specific arrangements such as health maintenance organizations (HMOs) and preferred provider organizations (PPOs). As of 1996, more than 100 million Americans are enrolled in HMOs, according to the Group Health Association of America.¹ This number continues to grow as public and private payers begin transferring the individuals they cover into managed care programs.⁶ See *Box 3* for a dictionary of common managed care terminology.

Capitation

Capitation is a per-member, monthly payment to a provider covering contracted services, paid in advance of their delivery. The provider agrees to provide specified services to HMO members for a fixed, predetermined payment for a specified length of time, regardless of how many times the member uses this service. The rate may be fixed for all members, or it can be adjusted for the age and sex of the member based on actuarial projections, as illustrated in *Figure 5*.

Figure 4
Managed Care

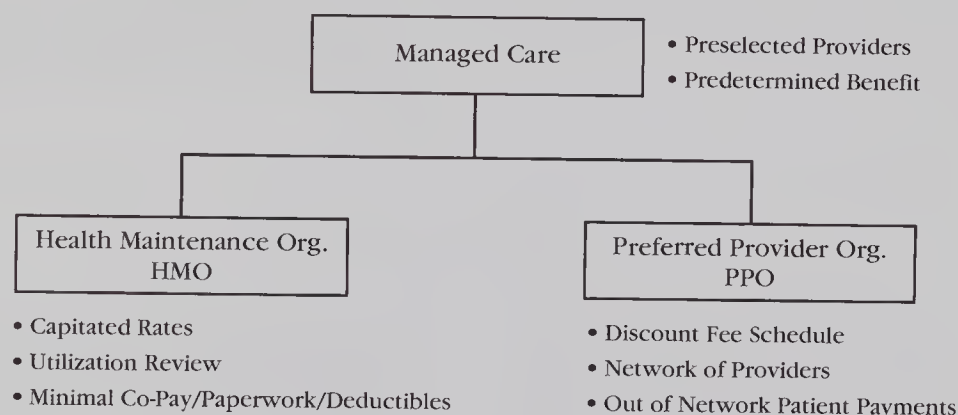
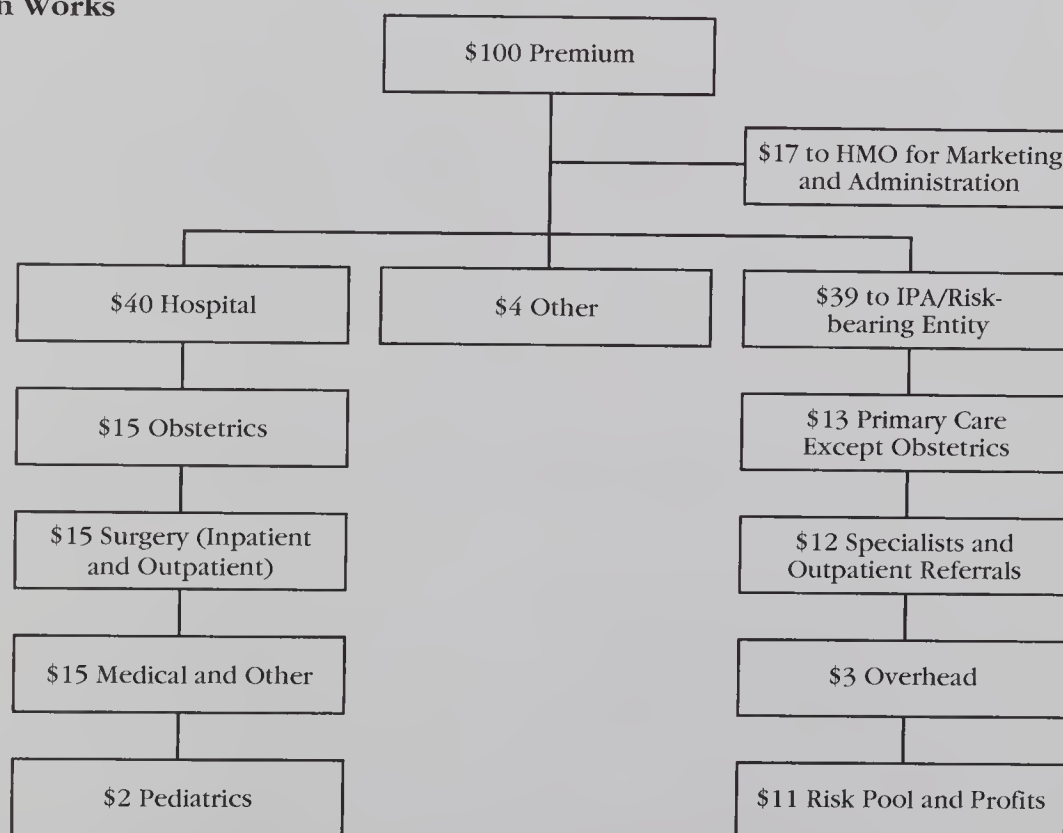


Figure 5
How Capitation Works



BOX 3: The ABCs of Managed Care Terms 3,11-13**Adjusted Average Per Capita Cost (AAPCC)**

An actuarial measure of the costs that would have been incurred by Medicare on behalf of enrollees of an HMO if they received their covered services in fee-for-service Medicare. The AAPCC is utilized in the payment formula to determine a capitated rate under Medicare Risk Contracts.

Capitation

Capitation is a per-member, monthly payment to a provider covering contracted services, paid in advance of its delivery. The provider agrees to provide specified services to HMO members for a fixed, predetermined payment for a specified length of time, regardless of how many times the member uses this service. The rate may be fixed for all members or it can be adjusted for the age and sex of the member based on actuarial projections.

Carve Out

Refers to funding for groups or single specialized services that are not included in the contract with the managed care entity. Carved out services can be operated on a fee-for-service basis or can be capitated and managed.

Case Management

System for assessment, planning, treatment, referral, and follow-up of patients. Goal is to provide comprehensive, continuous service and to coordinate payment/reimbursement.

Coinsurance/Copayment

The amount the carrier designates to be paid by the patient (eg, 20% coinsurance and 80% insurance payment). The copayment can also be a flat per visit amount designated as the copayment (eg, \$5 per encounter).

Contractual Allowance

The difference between billings at established charges and amounts received from third-party payors under contractual agreements.

Coordination of Benefits

A procedure implemented by the group health insurance industry to ensure that each responsible insurer pays its portion of claims and prevents double recovery of claims by insureds. This allows carriers to coordinate benefits to limit payments or the costs of services to no more than 100% of the actual charges and designate the order in which the multiple carriers are to pay benefits.

Cost Contract

One means of participation in Medicare capitation with HCFA. Prepayment is based on estimated costs for the participating plan. Payments are adjusted at year end to coincide with actual costs.

Deductible

The portion of allowable charges for covered services each benefit year for which a patient is responsible before benefits begin.

Diagnosis Related Group (DRG)

A program in which hospital procedures are rated in terms of cost, taking into consideration the intensity of the services delivered. A standard flat rate per procedure is developed from the scale and is paid by Medicare to its beneficiaries regardless of the cost to the hospital to provide the service.

Diagnostic Group Contract

One means of participation in Medicare capitation with HCFA. Plan capitation is based on the severity of illness of the plan's actual membership rather than average overall Medicare expenditures in the region.

continued

BOX 3: The ABCs of Managed Care Terms 3,12-14**Durable Medical Equipment (DME)**

Medical equipment such as wheelchairs, crutches, and canes.

Fee-for-Service

Traditional provider reimbursement in which the physician is paid according to the service performed. This is the system used by conventional indemnity insurers.

Fiscal Intermediary

An organization that acts as intermediary between the hospital and a third-party payor. It receives billings from the hospital and makes payments on behalf of the payor for covered services. It is, in turn, reimbursed by the third-party payor.

Gatekeeper

Within most HMOs, the primary care physician, or "gatekeeper," screens patients seeking medical care to eliminate costly and sometimes needless referrals to specialists for diagnosis and management. The gatekeeper is responsible for the administration of the patient's treatment and must coordinate and authorize all medical services, laboratory studies, referrals, and hospitalizations. In most HMOs, the patient must have prior authorization from the primary-care physician before visiting a specialist. Without this approval, the patient will have to pay the specialist in full.

Group Model HMO

A system in which physicians are members of a partnership or a service corporation which contracts with an HMO to provide services to members for a predetermined per member, per month amount. The physicians' group pays its own members according to a prearranged schedule (such as salary plus incentives). Physicians may care for fee-for-service patients and HMO patients.

Health and Human Services (HHS)

An umbrella agency of the federal government that is composed of many subagencies (HCFA, Public Health, Office of Education, etc).

Health Care Financing Administration (HCFA)

The federal agency responsible for administering the Medicare program.

Health Care Prepayment Contract

One means of participation in Medicare capitation with HCFA. Only physicians and other Part B services are capitated and managed.

Health Maintenance Organization (HMO)

An organized system of healthcare delivery that provides comprehensive health services to voluntarily enrolled members. Each member pays a periodic per capita amount which does not fluctuate in relation to the number or extent of services rendered. Unlike insurance plans, claims are not submitted for reimbursement; rather, the HMO subscriber pays a fixed monthly amount in advance regardless of the number or type of medical service he or she receives.

Independent Practice Association (IPA)

In its most basic form, an IPA is a physicians' organization that provides services to HMO enrollees. Payments from the HMO may be fee-for-service, capitation, or another variation. The physician shares the responsibility for the total cost of care by agreeing to have some portion of each fee withheld and put into a common risk pool, to be redistributed among all the participating physicians if the IPA has a financially successful year.

continued

BOX 3: The ABCs of Managed Care Terms ^{3,12-14}**Integrated Delivery System (IDS)**

A healthcare delivery system in which providers are aligned through ownership and other legal relationships to lower costs, improve patient outcomes, enhance provider viability, and reduce administrative burdens. IDSs are often characterized as “seamless” in contrast to “fragmented” because of the sharing of information and other coordination and interaction among providers.

International Classification of Diseases (ICD9)

[9th revision, *Clinical Modification*, 4th edition (ICD-4-CM)] The diagnosis coding system used by all physicians, hospitals, and related facilities.

Managed Care

A collective term defining the movement toward care delivery management that offers health care to voluntary members of an organization in return for a uniform, prepaid fee. The organization, management, and financing of Medicare and other health care services provided to individuals or groups of individuals enrolled under a managed care health plan.

Managed Care Organization (MCO)

An organization providing care delivery to voluntary members of the organization in return for a uniform, prepaid fee.

Medigap Policy

Private insurance provided by carriers to supplement Medicare reimbursement for medical services. Because Medicare pays physicians for services according to Medicare’s fee schedule, regardless of what the physician charges, the patient may be required to pay the physician the difference between the Medicare reimbursement and the physician’s fee. Medigap fills in this gap in reimbursement so that the Medicare beneficiary is not at risk for the difference.

Medicare Part A

In general, those services rendered by institutions (eg, hospitals).

Medicare Part B

Generally medical and surgical physicians’ services and outpatient diagnosis and treatment.

Modified Fee-for-Service Compensation

A system in which physicians are paid on a unit-of-service basis.

Outcome Measurements

A means of measuring cost and quality of care.

Outcome Management

A clinical outcome is the result of medical or surgical intervention or nonintervention. In theory, through a database of outcomes experience, caregivers will learn which treatments consistently result in better outcomes for patients. Outcomes management will, as a consequence, lead to medical protocols.

Peer Review Organization

A group of practicing doctors and other health care professionals under contract with the federal government to review the care provided to managed care patients.

continued

BOX 3:**The ABCs of Managed Care Terms** 3,11-13**Physician Hospital Organization (PHO)**

PHOs are formed to enable hospitals to use the primary care physician gatekeeper approach as they attempt to secure managed care contracts. The PHO assumes risk, and risk is shared by the hospital and physician components.

Point of Service Plan (POS)

A hybrid between a traditional HMO and a PPO. In a POS plan, the insured is encouraged to seek medical care in a preferred provider network with a gatekeeper, but care may be obtained outside the network at reduced coverage levels and at a higher cost. Often a copayment is assessed for seeking care outside of the network. A POS plan resembles a PPO but is in actuality an open-ended HMO.

Preferred Provider Organization (PPO)

A group of health care providers (professional or institutional) who agree to provide services to a specific pool of patients (usually employment-based groups) at an agreed-upon fee-for-service discounted rate. The patient retains free choice of providers but is given an economic incentive (often first dollar coverage) to use member providers. Unlike HMOs, PPOs usually do not involve prepayment.

Primary Care Case Management/Primary Care Physician

A process by which a primary care physician is designated as the enrollee's primary physician and is responsible for providing, managing, and arranging for all the health care needs of the enrollee. All referrals to a specialist and hospital admissions must be preauthorized by the enrollee's primary care physician. (Often referred to as the gatekeeper system.)

Prospective Reimbursement

A method of reimbursement whereby payment or payment rules are determined before the start of the year, and are the basis for reimbursement to the hospital for services provided to third-party beneficiaries.

Retrospective Reimbursement

A method of reimbursement based on actual or defined costs incurred during the year. At the end of the year, the actual or defined costs of providing services to third-party beneficiaries are determined, and this amount is reimbursed to the hospital.

Risk Adjusting

Accounts for pertinent patient characteristics before making inferences about the designed utilization rate or effectiveness of care.

Risk Contract

The plan accepts full responsibility for health care costs under both Medicare Part A (hospital) and Part B (physician). HCFA pays the plan a capitated amount in advance.

Social Health Maintenance Organization (SHMO)

A concept intended only for the elderly. An SHMO provides comprehensive health and long-term-care benefits to Medicare beneficiaries. Unlike other HMOs that enroll Medicare patients, care in an SHMO is reimbursed at 100%. Currently, demonstration projects funded by the federal government are being evaluated for the feasibility of extending them to a broader segment of the Medicare population.

continued

BOX 3: *The ABCs of Managed Care Terms* ^{3,11-13}**Staff Model HMO**

An HMO in which physicians are direct, salaried employees of the HMO. Physicians deliver care in health centers owned or operated by the HMO, and share equipment, medical records, and personnel. Staff and group model HMOs are often referred to as closed-panel HMOs because subscribers are locked into using the HMO physicians. The physician services only HMO members.

Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA)

Reimbursement act passed to encourage HMOs to enter into Medicare capitation.

Utilization

The percentage of bed usage (occupancy) experienced by the hospital. Third-party utilization refers to the ratio of hospital services provided to third-party beneficiaries in relation to services provided to all patients of the hospital. This is usually based upon days, charges, or costs.

Quality Initiatives

Health care providers have begun consolidating (through mergers, acquisitions, partnerships, and contracting) to form integrated health networks in a geographic region. As a result of these networks, partners have benefited from lower costs, improved quality outcomes, enhanced provider viability, and reduced administrative burdens. Total Quality Management (TQM) and Continuous Quality Improvement (CQI) are two management techniques that have been used to improve quality and reduce costs.⁴

DOCUMENTING OUTCOMES

The 1988 *Surgeon General's Report on Nutrition and Health* identified that eight of the 10 leading causes of death (including heart disease, stroke, diabetes mellitus, and some forms of cancer) have been linked to diet and alcohol. The publishing of this report gave RDs an important opportunity: By combining expertise in food, nutrition, and disease management, the RD provides comprehensive nutrition that can delay the development of these diseases, save health care dollars, and avoid unnecessary human suffering.

In November 1996, The American Dietetic Association (ADA) contracted with the Lewin Group to conduct an economic study of the cost of covering MNT as a Part B benefit of the Medicare program. The Lewin Group selected the database of Group Health Cooperative of Puget Sound for analysis.⁸ Their database consisted of 16,000 Medicare patients with diabetes and 38,000 with cardiovascular disease. The focus of the study was to estimate cost and cost-savings to Medicare Part B through implementation of coverage of nutrition services.

The study results indicated that MNT could save substantial Medicare dollars. If coverage had begun in 1998, savings to Medicare would have been \$11 million in 2001 and would have increased through 2004. The study showed diabetes and cardiovascular disease consumed approximately 60% of annual Medicare dollars.

An internal analysis of nearly 2,400 case studies submitted to the ADA showed that on average more than \$8,000 per patient can be saved with the intervention of MNT. These case studies confirmed diseases and conditions in which MNT was appropriate. The average annual or one-time savings per case includes⁹:

- **Type 1 Diabetes** (insulin-dependent) — \$9,049 savings per case because the diabetic complications that result in hospitalization are reduced.
- **Type 2 Diabetes** (non-insulin-dependent) — \$1,994 savings per case because MNT reduces or eliminates the need for insulin or oral agents.
- **Cancer** — \$10,535 savings per case because specialized nutrition therapy enhances the effectiveness of chemotherapy and radiation therapy.
- **Heart Disease** — \$9,134 savings per case because MNT reduces the need for drugs and other artery-clearing procedures and/or surgery.
- **Kidney Disease** — \$18,467 savings per case by postponing the need for dialysis.
- **High Cholesterol** — \$2,709 savings per case by reducing the need for drugs.
- **Hypertension** — \$4,075 savings per case by reducing drug use and preventing complications such as stroke.

- **Burns and Surgery** requiring tube or intravenous feedings — \$7,051 savings per case by transitioning the patient to less invasive and less extensive nutrient sources.

OPPORTUNITIES FOR SUCCESS

The dietetic practice moving toward the 21st century is in transition, and practitioners need to develop and adapt to new practice models. The health care system is continually challenged by the need to balance costs and quality. The RD must also adapt to new organizational patterns and alter practice paradigms.

Opportunities for the RD in a managed care environment include^{2,4,10}:

- Becoming involved with institutional TQM/CQI initiatives, practice guidelines, and clinical outcome measures with a focus on costs
- Demonstrating to payers that good nutrition is fundamental to good health — reduced length of stay (LOS), reduced number of readmissions, prevention of complications, faster healing, and improved quality of life
- Influencing local MCOs to develop practice guidelines using MNT benchmarks
- Monitoring growth of long-term care insurance and taking a nutrition advocacy position
- Marketing to case managers by providing information regarding cost-effectiveness as well as clinical evidence of the benefits of medical nutrition intervention

With any new paradigm come opportunities, challenges, and risks. No one can predict with assurance what new diseases may develop over the next decade, what new universe medicine will conquer, or what the reimbursement climate will be.¹

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Continuum of Care and Services

The “graying” of America is a phenomenon that continues to challenge the health care industry. Current life expectancy is 79 years of age for women and 72 years of age for men. In 1994, 13% of Americans were 65 years of age or older.¹ By the year 2030, that percentage is expected to climb to 20%, due to aging baby boomers and longer life expectancies.² The 85 years and older population is the most rapidly growing age group in this country.

Older consumers want choices in health care services and living options to promote the highest quality of life possible at the most reasonable cost. Today, there is a complete continuum of care available to allow choices in health care and living options: home care, adult day care, ambulatory care, acute and subacute care, retirement communities, assisted living facilities, group homes, and extended care facilities. However, the current system is fragmented and services may not be available to everyone. In addition, acute and subacute care facilities are discharging clients sooner, usually with the assumption that community services will provide care that was previously provided in hospitals.

Health care costs consumed 21% of the federal government’s expenses and accounted for 14.3% of the gross domestic product in 1993.¹ Experts estimate that the United States will spend \$1.65 trillion on health care by the year 2000 if no changes are made.² These factors have driven the health care system to make major changes in cost control. By the year 2005, approximately two-thirds of the U.S. population will be part of a capitated health care system.³ This consolidation of the health care industry has created competition, with a focus on consumer satisfaction and quality services at a reasonable cost.

From a nutrition standpoint, the health of many older adults is at risk due to malnutrition. Many are on fixed incomes, and 20% of older adults may be considered poor or nearly poor.⁴ Food shopping, storage, and preparation may be difficult due to physical and financial restrictions. Older adults are sometimes forced to choose between buying medications or buying food.

Some are fortunate to have families who can help them; others may receive assistance through programs such as Meals on Wheels or congregate feeding programs.

In older adults and disabled populations, malnutrition and dehydration contribute to:

- Complications such as poor wound healing
- Increased incidence of fractures
- Development of pressure ulcers
- Depressed immune system
- Low resistance to fighting infection

This chapter focuses on the various settings available to meet the health care and living needs of the older and disabled population, and discusses opportunities for the dietetics professional within those settings.

INSTITUTIONAL-BASED SERVICES

Institutional-based services available to the older and disabled population cover options for housing, options for delivery of care, and additional options for clients requiring extended care. For example, the growing number of options for living arrangements can take the form of independent living or congregate care, retirement communities, assisted living facilities, personal care, adult care, or group homes. Integrated care networks serve these various settings by providing health care services through acute care and ambulatory care. For those requiring extended care, transitional care, subacute care, rehabilitation, and extended care facilities are available. Hospice services may be provided in the client’s home or in a facility setting. The dietetics professional has a vital role in each of these settings, with many opportunities available to assist in improving the quality of life of these clients.

HOUSING

Today many senior citizens are choosing to live in alternate settings, free from the maintenance hassles of a home of their own.

Independent Living and Congregate Care

Independent living facilities, such as senior citizen apartment buildings and retirement villages, offer a wide variety of services to the active senior. Many older adults find these living arrangements attractive for a number of reasons.

- Maintenance is provided.
- Congregate meals may be provided.
- Living space is efficient and easy to maintain.
- Housekeeping and medical services may be available.
- Activities keep those who are interested entertained.
- Those who wish to come and go do so at will.

In addition, those who live alone feel more secure and less isolated when they are part of a congregate living center. Help is close at hand, and company is just across the hall.

Continuing Care Retirement Centers

Continuing care retirement centers (CCRCs) offer a chance to “age in place” through multiple levels of living such as independent, assisted living, extended care, and/or subacute care. Clients feel comfortable knowing that they will be taken care of at every stage of their health care needs. Generally, these communities are similar to self-sustained villages where people live and congregate. Most have cafeteria- or restaurant-style dining available for independent clients, and tray service or dining room service for other levels of care. Different types of services are available to the clients depending on individual need, and activities and medical and housekeeping services are geared to each level of need.

Personal Care/Adult Care and Group Homes

Adult care facilities provide clients with personal care services such as activities of daily living (ADL), self-administration of medication, and preparation of therapeutic diets. These facilities tend to have fewer clients per facility and do not provide skilled nursing services.

Group homes offer clients the opportunity to live in homelike settings with the assistance and supervision needed to live semi-independently. Different types of group homes are available for various clientele: older adults, AIDs clients, mentally ill and/or developmentally disabled, and others. Group homes are usually in residential areas and may be close to bus and rail lines for easy access to public transportation. Depending on the level of care of the group home, clients may come and go as they please, have around-the-clock care, or anything in between. Caregivers in these facilities assist

with meal preparation, laundry, and housekeeping. They may also assist with ADLs such as bathing, dressing, self-administration of medications, habilitation (life skills), or behavioral programs (for the mentally ill or developmentally disabled). Group homes are usually responsible for providing housing, food, and support services to maintain the health, safety, and welfare of the clients. The purpose of most group homes is to promote independent living skills, with the ultimate goal of out-placing clients to less restrictive living settings.

INTEGRATED CARE NETWORKS

Health care reform is driving the development of an integrated system of collaborative networks formed through the strategic cooperation of providers.⁵ Hospital/acute care, ambulatory care, pharmacy services, and interdisciplinary health care teams are part of an integrated network whose goal is efficiency and quality of care. As an integral member of the interdisciplinary health care team, the RD/DTR needs to share client information from one setting to another to help integrate services for a smooth delivery of care across the continuum.

Hospital/Acute Care

Changes in health care have left hospitals with an overabundance of beds due to reduced length of stay (LOS), increased availability of outpatient services, and alternative placements such as subacute care and extended care facilities.⁶ In addition, the government, insurance companies, employers, and consumers are forcing cost containment through consolidation, mergers, and downsizing. In 1995 alone, 700 hospitals were involved in mergers and acquisitions.⁶ Between 1994 and 1995, 20% of community hospitals changed hands.⁶

Consolidation and reduced hospital census have created a reduction in the number of necessary caregivers. Some hospitals have reduced labor hours in clinical dietetics and food service staffing, and have implemented labor-saving systems such as nonselect menus and convenience foods. Some have even implemented “kitchenless kitchens,” serving previously prepared meals that are heated and served on each patient floor.

In this environment, the importance of medical nutrition therapy (MNT) as a preventive and therapeutic measure has been confirmed through numerous studies showing that older adults have the greatest risk of malnutrition and its complications. Approximately 30% to 55% of the older adults admitted to hospitals and 39% of those admitted to extended care facilities are malnourished.⁷ Hospital charges for older malnourished clients are almost double the average and their average length

of stay (ALOS) is 5.6 days longer than their well-nourished counterparts.^{7,8} In addition, hospitalizations are \$10,000 more costly and readmissions are more frequent for the malnourished older adult than for well-nourished older adults.⁹

Ambulatory Care

Cost-containing managed care programs discharge clients sooner from hospitals and extended care facilities, decreasing the ALOS, care, and services provided. As a result, ambulatory care has become an even more significant component of the health care delivery system. Ambulatory care centers provide physician services including visits, outpatient surgeries, follow-up care, rehabilitation, and other ancillary services. Nutrition services should be an integral component of care for ambulatory clients, especially for the older adult and the chronically ill. The American Dietetic Association (ADA) estimates that 85% of people age 65 and older have one or more chronic diseases in which nutrition plays a role.^{7,10}

Older adults who are at risk for malnutrition visit their physicians more often than well-nourished clients.⁹ Nutrition screening is a vital tool for determining the risk of malnutrition and appropriate referral to an RD. The DETERMINE Your Nutritional Health Checklist,¹⁰ developed by the Nutrition Screening Initiative (NSI), is widely used as an effective tool for those clients who can benefit from MNT. Refer to Chapter 14 for more information on the DETERMINE Your Nutritional Health Checklist developed by the NSI.

Pharmacy Services

Many older clients with chronic diseases require the extended use of costly medications. Drug-nutrient interactions are common and may cause nausea, vomiting, diarrhea, anorexia, or other side effects that have a direct impact on nutritional status. Most pharmacies now provide information to their clients on how to take medications (ie, with food or on an empty stomach), but it is difficult for the pharmacies to give detailed suggestions on how to counteract the potential nutrition-related side effects. The RD/DTR can play a major role in helping the older adult to avoid malnutrition as a result of the side effects caused by polypharmacy, chemotherapy, and other harsh medical treatments.

The RD also plays a vital role in intravenous therapies, especially with total parenteral nutrition (TPN) and peripheral parenteral nutrition (PPN). By taking a proactive role to team up with pharmacies and infusion therapy companies, RDs can help screen, assess, and refer appropriate candidates for these beneficial nutrition therapies. For more detailed information on this topic, refer to Chapter 11.

Interdisciplinary Assessment Team

The interdisciplinary team (physician; nurse; RD/DTR; social services; caregiver; respiratory care practitioner; physical, occupational, and/or speech-language therapist; and other health care professionals) is responsible for the comprehensive screening, assessment, and planning for health care and treatment. The team draws information from the medical record, the client, and the family to assess the client's medical, socioeconomic, cognitive, and functional abilities. Nutrition assessment includes an evaluation of the client's ability to shop, cook, and eat a healthy diet. Team conferences are held so that the interdisciplinary professionals can share information with the client and family, and allow the client to have a choice in treatment options.

CARE SETTINGS

Extended Care Facilities

The number of people in the 85 and older age group in the United States has experienced a 34% growth in the past 10 years.¹¹ Approximately 24% of this group lives in extended care facilities (nursing facilities and skilled nursing facilities).⁴ Consumer demands and cost containment are driving extended care facilities to compete with assisted living facilities and to prove to managed care organizations and hospital systems that they can provide cost-effective, quality care.

In addition, consumers are now demanding that these extended care facilities create a homelike atmosphere that reinforces the psychosocial aspects of care and promotes improved quality of life. The physical layout, for example, needs to focus on providing areas for clients, families, and caregivers to congregate for socialization in an inviting and homelike atmosphere, promoting a sense of community and fulfilling emotional needs.

The number of Medicare-certified skilled nursing facilities (SNFs) grew 38% from 1986 to 1996.¹¹ Hospital-based SNFs grew 250%, partly due to the higher reimbursement rates hospitals command.¹¹ Because of the current shift in care from hospital settings to extended care facilities (ECFs), nursing facilities are now able to offer services that used to be provided by hospitals. ECFs have increased the intensity of their services, especially in the area of therapies (physical, speech-language, and occupational).

In the midst of these changes, abuses in the reimbursement system have forced the government to review the Medicare system. The Health Care Financing Administration (HCFA) has proposed a "beneficiary-centered" system with less fragmentation, overlapping of services, and an integrated payment arrangement.⁴ Reimbursement to an extended care facility is now

determined via a resident assessment instrument (RAI) known as the Minimum Data Set (MDS) that collects data for such areas as functional and physical status and sets reimbursement through a case mix classification system known as Resource Utilization Groupings (RUGS).

Transitional Care/Subacute Care Facilities

Transitional/subacute care is a rapidly growing segment of the health care industry, posting an income of \$1 billion in 1993 that is expected to grow to \$10 to \$30 billion by the year 2000.² Subacute care units provide care that is less intensive than an acute facility, but more intensive than an extended care facility. They bridge the gap between acute care and home or an extended care facility. Care can be provided at a much lower cost than in an acute care setting, mostly because of reduced overhead. Some providers estimate that they can provide care at a 30% to 60% cost savings.² Subacute care is “a comprehensive and cost-effective inpatient program for clients who have had an acute event as a result of an illness, injury, or exacerbation of a disease process; have a determined course of treatment; and do not require intensive diagnostic procedures.”¹²

ALOS depends on the type of unit and the level of care.

- Transitional is 5 to 30 days ALOS with high nursing acuity.
- General subacute is 10 to 40 days ALOS with weekly medical monitoring, lower acuity, and rehabilitation therapy daily.
- Chronic is 60 to 90 days ALOS with medical monitoring every 2 to 4 weeks.
- Long-term transitional is 25 days or more ALOS with frequent physician monitoring and medical complex care.²

Clients may need specialized MNT for common diagnoses such as cardiovascular disease, orthopedic concerns, pulmonary diagnoses, cancer, renal disease, wound management, or postsurgery.

Rehabilitation Facilities

Rehabilitation facilities specialize in extensive rehabilitation with the goal of moving clients back to their homes or into an extended care facility. Intensive rehabilitation may include daily physical therapy, occupational therapy, and/or speech-language therapy. Although the interdisciplinary team plans each client's care, care may be guided by a physician who specializes in rehabilitation. Clients may be taught food preparation, self-feeding, or dysphagia techniques to assist them in being independent when they return home.

Assisted Living Facilities

Assisted living is a growing area of health care that offers the opportunity to live semi-independently while acquiring the services that clients can no longer provide for themselves. Clients may be given meals, housekeeping and laundry services, and assistance with administration of medications, but in other ways these same clients are fairly independent in their own care and do not require around-the-clock nursing assistance. Assisted living facilities tend to be more consumer-driven and focus on enhancing quality of life through freedom of choice, independence, privacy, respect, dignity, and psychosocial well being.

The Assisted Living Quality Coalition (the Coalition) defines an assisted living setting as “a residential setting that provides or coordinates personal services, 24-hour supervision and assistance..., activities, and health-related services

- designed to minimize the need to move;
- designed to accommodate individual clients' changing needs and preferences;
- designed to maximize client's dignity, autonomy, privacy, and independence; and
- designed to encourage family and community involvement.”¹³

THE DIETETICS PROFESSIONAL'S ROLE

Dietetics professionals are needed in all of the settings reviewed in this section to provide services in the following areas: food production, food purchasing, inventory control, kitchen design, menu development, sanitation, food safety, regulatory compliance, rehabilitation of dining skills, and clinical areas. Regulatory compliance is particularly important. The federal government writes Medicare and Medicaid regulations, but individual states may also have regulations governing extended care facilities, mentally retarded developmentally disabled (MRDD) facilities, and the other settings discussed in this section. Because many states license and regulate these facilities, the state health department is the best source of information on the specific regulations in your state.

COMMUNITY-BASED HEALTH CARE

Cost containment of health care services has encouraged the increase in the use of community-based services as a less costly care option. Reduced lengths of stay in acute, subacute, and extended care facilities have also created an increased need for these services. Community support systems can provide assistance with everything from housekeeping and meals to assistance with activities of daily living. The professional ser-

vices of the RD/DTR are needed for individual and group nutrition counseling and classes.

Outpatient Clinics and Interdisciplinary Assessment Clinics

Ambulatory care centers are becoming multiple service providers, offering services such as physician and specialist care, outpatient surgery, wellness classes, rehabilitation, mental health care, and even fitness centers. Caregivers provide education programs, exercise programs, and guidance. Clients come from home, group homes, adult care centers, or assisted living facilities to receive treatment or preventive care.

Adult Day Care

Adult day care centers offer a respite for the at-home caregiver. Family members can take their loved ones to day care while they work, shop, run errands, or rest. Day care facilities normally provide activities throughout the day, and in some cases may provide meals and therapies. Adult day care centers need menus and recipes that meet the daily needs of their clients. They may also need staff training and assistance with regulatory compliance.

Congregate Meals and Food Stamps

The Older Americans Act Title III Programs provide congregate and home-delivered meals to persons 60 years of age and older. The Agency on Aging coordinates these programs in which congregate meals are served in schools, churches, senior centers, and other settings. The Title III program requires that the centers serve at least one meal per day, 5 days per week, and that menus be approved by a registered dietitian. They give preference to older adults with the greatest financial and social needs.⁸

Many nutrition programs for the elderly are finding serious nutrition-related problems among the population they serve. Unfortunately, services are not available for many needy older adults. For example, county welfare offices control the distribution of food stamps to those in need, but many of the older adults in this country who need food stamps are either ineligible or too proud to accept what they consider “charity.”⁸

HOME CARE

Home health care experienced a dramatic 56% growth from 1986 to 1996. Both the intensity of services offered and the number of visits provided (from an average of 25 per user in 1984 to an average of 65 visits per user in 1994) have experienced a sharp increase.¹¹ This growth in home health care is due in part to the decreased ALOS in acute care settings and the desire of

the older adult to remain at home. In addition, the growing range of options for care and services helps promote independent living for as long as possible. For example, the National Aging Services Network, which was mandated by the Older Americans Act, provides supportive services to assist clients in staying at home. Services are provided on a sliding scale fee and may include transportation, home-delivered meals, personal care, homemaker support, and other home care services such as medical and preventive health care. Nutrition services can be covered in administrative costs or through other reimbursement programs such as Medicaid waivers. However, the availability of nutrition services varies greatly across the country, and many needs go unmet as a result of fragmentation of services.

Home Health Agencies

Approximately 71% of home health clients are 65 years of age or older.¹¹ Today, the focus of home health care is moving toward quality, efficiency, and cost-effectiveness, with home health providers needing to measure productivity, effectiveness, and outcomes of care. Increasing competition in the health care system is encouraging networking of providers, formation of strategic partnerships, and consolidation of businesses. Many home health agencies (HHAs) will become part of an integrated system with an emphasis on providing one-stop shopping for a seamless delivery of care.

Home Therapy and Home Infusion Services

Most HHAs have therapy services available for homebound clients. Physical therapists, physical therapy assistants, occupational therapists and assistants, and speech/language pathologists visit clients in the home to assess and provide therapies as needed. The RD can work jointly with speech/language pathologists to provide information on appropriate food consistencies and suggestions for dysphagia diets. Home infusion companies and home health agencies provide home IV therapy including antibiotic therapy, TPN, PPN, and hydration therapy. It is essential for the RD to be involved with TPN and PPN clients.

Home-delivered Meals

Ideally, home-delivered meals should be available to the approximately 8% to 16% of older adults who do not have access to a nutritionally adequate, culturally acceptable diet.⁴ According to a study published in the *Journal of The American Dietetic Association* in 1994, 66% of independent-living older adults have diets that are nutritionally inadequate.¹⁰ Federal programs reach only about one-third of these needy older adults, and some of the older adults who need these meals do not qualify to receive them. Approximately 41% of home-

delivered meal programs have waiting lists,⁴ and in some areas no home-delivered meals are available.

From 1980 to 1994, the number of meals delivered to homebound clients increased more than 200%.⁸ Estimates indicate that home-delivered meals can be provided to an individual for an entire year at approximately the same cost as a one-day hospital stay.⁷ The Agency on Aging contracts with providers who plan, prepare, and deliver meals to needy homebound people in a designated area. Contractors may be churches, extended care facilities, or other food service providers.

Homemakers and Personal Service

Approximately 50% of the 85-year-old and older population, and 9% of the 65- to 74-year-old population needs assistance with ADLs.⁴ Many of these older adults utilize the services of homemakers and personal service aides to assist with shopping, meal preparation, bathing, housekeeping, transportation, information sources, and other sources. These homemakers and aides can be trained to use the nutrition screening initiative (see the DETERMINE Your Nutritional Health Checklist in Chapter 14) to make referrals to the RD. They can also provide referrals to appropriate support staff such as nurses, therapists, and social services.

The Dietetics Professional's Role in Home Health Care

As the client population shifts from acute care to home care, the RD is taking a more active role in home health. Nutrition services can help to market an HHA by giving it a competitive advantage. Home intravenous and enteral companies need the expertise of the RD, especially for those clients who receive TPN, PPN, or enteral therapy at home. The RD can assist in preventing complications as a result of weight loss and malnutrition, work with providers and caregivers on cost-effective nutrition interventions, and work with insurance companies on reimbursement issues.⁵ Educating clients and caregivers, developing nutrition care maps and protocols for nutrition care, and securing reimbursement for nutrition services are some of the most important roles of the RD in home care.¹⁴ Knowledge of regulations for home care, visibility with the direct care staff, and public relations with administrative personnel are essential in home care work. The RD must be knowledgeable in nutrition care, equipment use, education, marketing, and political savvy to be successful.

OLDER ADULTS IN CORRECTIONAL FACILITIES

Food Management Magazine (December, 1997) called the situation of incarcerated older adults "Graying Behind Bars." Some estimates indicate that close to half

the inmate population will be over 50 years of age by the year 2025.¹⁵ This aging prison population will need more health care services, including MNT. Good nutrition care for this population can be part of a cost-effective health plan designed to avoid costly chronic illnesses such as heart disease, cancer, and diabetes. The difficulty in providing a healthy, low-fat diet, or providing any therapeutic diet, is that financial resources are restricted in this setting; however, balanced against the cost of a later illness, preventive MNT is an important part of a total program. Some correctional institutions utilize the services of the RD to assist in healthy menu writing, therapeutic diets, and, in some cases, nutrition counseling for diabetic or cardiac inmates.

Religious preferences may pose a challenge for the RD in correctional food service. To avoid lawsuits, inmates must have access to religious foods and medical care including the availability of medically necessary diets. Therapeutic diets in correctional facilities typically include fat/cholesterol-controlled, diabetic, sodium-controlled, high-fiber, renal, and dysphagia diets. Menus are developed with the Food Guide Pyramid as a guide, averaging recommendation of 2,800 to 3,200 calories per day.¹⁶

Many food service operations in correctional institutions put inmates to work in the kitchen. Although older inmates sometimes pose challenges in the work environment due to physical limitations, they can also be helpful in training younger inmates and setting a good example. The RD can help to set up training programs and develop creative ways to utilize older workers.

FUTURE DIRECTIONS

The future of health care holds many challenges for the RD/DTR. To be a viable participant in the managed care system of the future, we must expand our knowledge base to include business and entrepreneurial skills such as marketing, accounting, political and social savvy, creativity, and the ability to see the total picture. We have to be able to think outside of our profession to encompass the interdisciplinary team, the administration, and financial concerns.

Goals of Nutrition Care

As the health system continues to offer alternatives to traditional care, RD/DTRs must also offer alternatives in nutrition care. Nutrition care is a cost-effective method of preventing and treating many diseases and conditions. We must continue to document cost-effective outcomes of MNT and market nutrition services to managed care organizations.

The goals of nutrition care in a managed care environment include:

- Enhancing quality of life
- Promoting health and functional independence
- Risk reduction/complication reduction through MNT
- Cost reduction/cost containment
- Screening and referral for appropriate services throughout the continuum of care

Containing Health Care Costs

Managed care providers approach health care management with the least invasive, least intensive, and least expensive care available. Health care expenditures for the 65 years and older population will account for 50% of all health care expenditures in the United States by the year 2000, despite the fact that this consumer group will account for only 13% of the total population.¹⁷

MNT has been demonstrated to be a cost-effective, preventive intervention. A study released in 1997 by The Lewin Group indicated that if Medicare coverage of MNT would have begun in 1998, savings to the program would outgrow the cost of implementation within 3 years.¹⁸ Cost savings would be attributed to:

- Reduction in the number of hospital admissions and the LOS for those who are admitted
- Reduction in the complications that result in increased visits to physician offices
- Reduction in the use of costly medications
- Fewer surgeries
- Less need for IV feedings¹⁸

The RD needs to develop practice guidelines, nutrition protocols, and care maps or clinical/critical pathways to guide care, save time, and focus on preventive action with the goal of saving money by preventing health problems and reducing complications.

Documentation of positive outcomes such as cost-effectiveness data, impact on enhancing independence, and maintaining or improving quality of life is essential to demonstrating our worth to those who pay for our services — consumers, insurance companies, providers, and both federal and state governments.

Opportunities for Dietetics Professionals

Opportunities for the RD/DTR are available to those who develop skills and become creative in how they pursue and provide services. Competition will be fierce, and skills will need to be highly developed to remain competitive. It will be more important than ever to be open to collaborative efforts with other professionals. Following are tips and ideas to help in the pursuit of future career opportunities:

- Network with other professionals and with peers in other communities.
- Advocate for older adults to fight hunger, poverty, and malnutrition.
- Position MNT as an important component of care by marketing the value and increasing visibility.
- Integrate MNT as part of care and services provided in every area of the continuum of care (acute, subacute, assisted living facilities, extended care facilities, group homes, adult day care, home care).
- Become an active team member by being involved in development of clinical/critical pathways, focusing on MNT as an integral component of care.
- Educate health care professionals and clients on the importance of MNT.
- Assume influential roles in various settings. Network with case managers and decision makers, promote the value of MNT, and market MNT as part of a comprehensive health care plan.
- Develop skills in business, marketing, cost containment, problem-solving, computer technology, writing and speaking, risk taking, management, and entrepreneurial skills.¹⁹
- Complete outcome studies and share this information through publications and presentations to health care professionals, providers, and payers.
- Form affiliations, partnerships, and collaborations with other health care professionals both inside and outside of the dietetics field.
- Provide services to home health care agencies, home infusion companies, pharmacy companies, physician practice groups, and ambulatory care centers.
- Provide services to congregate meal programs for meal planning, supervision, and quality assurance.
- Provide services to extended care facilities, assisted living facilities, adult day care centers, group homes, and mental health care centers.

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3 CHAPTER

Standards of Practice for the Consultant Dietitian

To practice dietetics individuals are expected to develop competency through a supervised practice component in programs accredited or approved by the Commission on Accreditation/Approval for Dietetics Education (CAADE). Competency statements specify what every dietitian should be able to do at the beginning of his or her practice career. The core competency statements build on appropriate knowledge and skills necessary for the entry-level practitioner to perform reliably at the level indicated. One or more emphasis areas are added to the core competencies so that a supervised practice program prepares graduates for identified market needs. Thus, all entry-level dietitians will have the core competencies and additional competencies according to the emphasis area(s) completed.

CORE COMPETENCIES FOR ENTRY-LEVEL DIETITIANS

1. Perform ethically in accordance with the values of The American Dietetic Association.
2. Refer clients/patients to other dietetics professionals or disciplines when a situation is beyond one's level or area of competence.
3. Participate in professional activities.
4. Perform self-assessment and participate in professional development.
5. Participate in legislative and public policy processes as they affect food, food security, and nutrition.
6. Use current technologies for information and communication activities.
7. Supervise documentation of nutrition assessment and interventions.
8. Provide dietetics education in supervised practice settings.
9. Supervise counseling, education, and/or other interventions in health promotion/disease prevention for patients/clients needing medical nutrition therapy for common conditions (eg, hypertension, obesity, diabetes, and diverticular disease).
10. Supervise education and training for target groups.
11. Develop and review educational materials for target populations.
12. Participate in the use of mass media for community-based food and nutrition programs.
13. Interpret and incorporate new scientific knowledge into practice.
14. Supervise quality improvement, including systems and customer satisfaction, for dietetics service and/or practice.
15. Develop and measure outcomes for food and nutrition services and practice.
16. Participate in organizational change and planning and goal-setting processes.
17. Participate in business or operating plan development.
18. Supervise the collection and processing of financial data.
19. Perform marketing functions.
20. Participate in human resources functions.
21. Participate in facility management, including equipment selection and design/redesign of work units.
22. Supervise the integration of financial, human, physical, and material resources and services.
23. Supervise production of food that meets nutrition guidelines, cost parameters, and consumer acceptance.
24. Supervise development and/or modification of recipes/formulas.
25. Supervise translation of nutrition into foods/menus for target populations.

26. Supervise design of menus as indicated by the patient's/client's health status.
27. Participate in applied sensory evaluation of food and nutrition products.
28. Supervise procurement, distribution, and service within delivery systems.
29. Manage safety and sanitation issues related to food and nutrition.
30. Supervise nutrition screening of individual patients/clients.
31. Supervise nutrition assessment of individual patients/clients with common medical conditions (eg, hypertension, obesity, diabetes, diverticular disease).
32. Assess nutritional status of individual patients/clients with complex medical conditions (ie, more complicated health conditions in select populations, such as renal disease, multi-system organ failure, or trauma).
33. Manage the normal nutrition needs of individuals across the lifespan — infants through geriatrics — and a diversity of people, cultures, and religions.
34. Design and implement nutrition care plans as indicated by the patient's/client's health status.
35. Manage monitoring of patients'/clients' food and/or nutrient intake.
36. Select, implement, and evaluate standard enteral and parenteral nutrition regimens, for example, in a medically stable patient to meet nutritional requirements where recommendations/adjustments involve primarily macronutrients.
37. Develop and implement transitional feeding plans (ie, conversion from one form of nutrition support to another, such as total parenteral nutrition to tube feeding to oral diet).
38. Coordinate and modify nutrition care activities among caregivers.
39. Conduct the nutrition care component of interdisciplinary team conferences to discuss patient/client treatment and discharge planning.
40. Refer patients/clients to appropriate community services for general health and nutrition needs and to other primary care providers as appropriate.
41. Conduct general health assessment (eg, blood pressure, vital signs).
42. Supervise screening of the nutritional status of the population and/or community groups.
43. Conduct assessment of the nutritional status of the population and/or community groups.
44. Provide nutrition care for population groups across the lifespan — infants through geriatrics — and a diversity of people, cultures, and religions.
45. Conduct community-based health promotion/disease prevention programs.
46. Participate in community-based food and nutrition program development and evaluation.
47. Supervise community-based food and nutrition programs.

COMPETENCY STATEMENTS FOR EMPHASIS AREAS

All practice programs for dietitian education must offer at least one emphasis area. The emphasis areas are not intended to prepare specialists or advanced level practitioners as defined for credentialing purposes. Competencies for each emphasis area build on the core competencies and are designed to begin to develop the *depth* necessary for future proficiency in that area of dietetics practice. More experience in at least one area provides a model for learning throughout one's professional life.

For establishing an emphasis area, the program has the following options:

- Use one or more of the four defined emphasis areas.
- Develop a general emphasis by selecting a minimum of seven competency statements relevant to program mission and goals, with at least one from each of the four defined emphasis areas. The selected competencies should build on the core competencies. General emphasis does not mean achievement of all competencies from all emphasis areas.
- Create a unique emphasis area with a minimum of seven competency statements, based on environmental resources and identified needs.

Nutrition Therapy Emphasis Competencies

1. Supervise nutrition assessment of individual patients/clients with complex medical conditions (ie, more complicated health conditions in select populations, eg, renal disease, multi-system organ failure, trauma).
2. Integrate pathophysiology into medical nutrition therapy recommendations.
3. Supervise design through evaluation of nutrition care plan for patients/clients with complex medical conditions (ie, more complicated health

- conditions in select populations, eg, renal disease, multi-system organ failure, trauma).
- 4. Select, monitor, and evaluate complex enteral and parenteral nutrition regimens (ie, more complicated health conditions in select populations, eg, renal disease, multi-system organ failure, trauma).
- 5. Supervise development and implementation of transition feeding plans from the inpatient to home setting.
- 6. Conduct counseling and education for patients/clients with complex needs (ie, more complicated health conditions in select populations, eg, renal disease, multi-system organ failure, trauma).
- 7. Perform basic physical assessment.
- 8. Participate in nasogastric feeding tube placement and care.
- 9. Participate in waived point-of-care testing, such as blood glucose monitoring.
- 10. Participate in the care of patients/clients requiring adaptive feeding devices.
- 11. Manage clinical nutrition services.

Community Emphasis Competencies

- 1. Manage nutrition care for population groups across the lifespan.
- 2. Conduct community-based food and nutrition program outcome assessment/evaluation.
- 3. Develop community-based food and nutrition programs.
- 4. Participate in nutrition surveillance and monitoring of communities.
- 5. Participate in community-based research.
- 6. Participate in food and nutrition policy development and evaluation based on community needs and resources.
- 7. Consult with organizations regarding food access for target populations.
- 8. Develop a health promotion/disease prevention intervention project.
- 9. Participate in waived point-of-care testing, such as hematocrit and cholesterol levels.

Foodservice Systems Management Emphasis Competencies

- 1. Manage development and/or modification of recipes/formulas.
- 2. Manage menu development for target populations.

- 3. Manage applied sensory evaluation of food and nutrition products.
- 4. Manage production of food that meets nutrition guidelines, cost parameters, and consumer acceptance.
- 5. Manage procurement, distribution, and service within delivery systems.
- 6. Manage the integration of financial, human, physical, and material resources.
- 7. Manage safety and sanitation issues related to food and nutrition.
- 8. Supervise customer satisfaction systems for dietetics services and/or practice.
- 9. Supervise marketing functions.
- 10. Supervise human resource functions.
- 11. Perform operations analysis.

Business/Entrepreneur Emphasis Competencies

- 1. Perform organizational and strategic planning.
- 2. Develop business or operating plan.
- 3. Supervise procurement of resources.
- 4. Manage the integration of financial, human, physical, and material resources.
- 5. Supervise organizational change process.
- 6. Supervise coordination of services.
- 7. Supervise marketing functions.

Competencies for Entry-level Dietetic Technicians

Competency statements specify what every dietetic technician should be able to do at the beginning of his or her practice career. The competency statements build on appropriate knowledge and skills necessary for the entry-level practitioner to perform reliably at the level indicated.

- 1. Perform ethically in accordance with the values of The American Dietetic Association.
- 2. Refer clients/patients to other dietetics professionals or disciplines when a situation is beyond one's level of competence.
- 3. Participate in professional activities.
- 4. Perform self-assessment and participate in professional development.
- 5. Participate in legislative and public policy processes as they affect food, food security, and nutrition.

6. Use current technologies for information and communication activities.
7. Document nutrition screenings, assessments, and interventions.
8. Provide dietetics education in supervised practice settings.
9. Educate patients/clients in disease prevention and health promotion and medical nutrition therapy for common conditions (eg, hypertension, obesity, diabetes, diverticular disease).
10. Conduct education and training for target groups.
11. Assist with development and review of educational materials for target populations.
12. Apply new knowledge or skills to practice.
13. Participate in quality improvement, including systems and customer satisfaction, for dietetics service and/or practice.
14. Participate in development and measurement of outcomes for food and nutrition services and practice.
15. Participate in organizational change and planning and goal-setting processes.
16. Participate in development of departmental budget/operating plan.
17. Collect and process financial data.
18. Assist with marketing functions.
19. Participate in human resource functions.
20. Participate in facility management, including equipment selection and design/redesign of work units.
21. Supervise organizational unit, including financial, human, physical, and material resources and services.
22. Supervise production of food that meets nutrition guidelines, cost parameters, and consumer acceptance.
23. Develop and/or modify recipes/formulas.
24. Supervise translation of nutrition into foods/menus for target populations.
25. Design menus as indicated by the patient's/client's health status.
26. Participate in applied sensory evaluation of food and nutrition products.
27. Supervise procurement, distribution, and service within delivery systems.
28. Supervise safety and sanitation issues.
29. Perform nutrition screening of individual patients/clients.
30. Assess nutritional status of individual patients/clients with common medical conditions (ie, health conditions addressed by health promotion/disease prevention activities or chronic diseases of the general population, eg, hypertension, obesity, diabetes, diverticular disease).
31. Assist with nutrition assessment of individual patients/clients with complex medical conditions (ie, more complicated health conditions in select populations, eg, renal disease, multi-system organ failure, trauma).
32. Participate in the management of the normal nutrition needs of individuals across the lifespan (ie, infants through geriatrics and a diversity of people, cultures, and religions).
33. Assist with design and implementation of nutrition care plans as indicated by the patient's/client's health status.
34. Monitor patient's/client's food and/or nutrient intake.
35. Participate in the selection, monitoring, and evaluation of standard enteral nutrition regimens (ie, in a medically stable patient to meet nutritional requirements where recommendations/adjustments involve primarily macronutrients).
36. Implement transition feeding plans.
37. Participate in interdisciplinary team conferences to discuss patient/client treatment and discharge planning.
38. Refer patients/clients to appropriate community services for general health and nutrition needs and to other primary care providers as appropriate.
39. Conduct general health assessment (eg, blood pressure, vital signs).
40. Conduct screening of the nutritional status of the population and/or community groups.
41. Assist with assessment of the nutritional status of the population and/or community groups.
42. Participate in nutrition care for population groups across the lifespan (ie, infants through geriatrics and a diversity of people, cultures, and religions).
43. Participate in community-based or worksite health promotion/disease prevention programs.
44. Participate in development and evaluation of community-based food and nutrition programs.
45. Implement and maintain community-based food and nutrition programs.

THE AMERICAN DIETETIC ASSOCIATION CODE OF ETHICS FOR THE PROFESSION OF DIETETICS

Preamble

The American Dietetic Association and its credentialing agency, the Commission on Dietetic Registration, believe it is in the best interests of the profession and the public it serves that a Code of Ethics provide guidance to dietetic practitioners in professional practice and conduct. Dietetic practitioners have voluntarily developed a Code of Ethics to reflect the ethical principles guiding the dietetic profession and to outline commitments and obligations of the dietetic practitioner to self, client, society, and the profession.

The purpose of the Commission on Dietetic Registration is to assist in protecting the nutritional health, safety, and welfare of the public by establishing and enforcing qualifications for dietetic registration and for issuing voluntary credentials to individuals who have attained those qualifications. The Commission has adopted this Code to apply to individuals who hold these credentials.

The Code of Ethics applies in its entirety to members of The American Dietetic Association who are Registered Dietitians (RDs) or Dietetic Technicians, Registered (DTRs). Except for sections solely dealing with the credential, the Code applies to all American Dietetic Association members who are not RDs or DTRs. Except for aspects solely dealing with membership, the Code applies to all RDs and DTRs who are not ADA members. All of the aforementioned are referred to in the Code as "dietetic practitioners."

Principles

1. The dietetic practitioner provides professional services with objectivity and with respect for the unique needs and values of individuals.
2. The dietetic practitioner avoids discrimination against other individuals on the basis of race, creed, religion, sex, age, and national origin.
3. The dietetic practitioner fulfills professional commitments in good faith.
4. The dietetic practitioner conducts himself/herself with honesty, integrity, and fairness.
5. The dietetic practitioner remains free of conflict of interest while fulfilling the objectives and maintaining the integrity of the dietetic profession.
6. The dietetic practitioner maintains confidentiality of information.
7. The dietetic practitioner practices dietetics based on scientific principles and current information.

8. The dietetic practitioner assumes responsibility and accountability for personal competence in practice.
9. The dietetic practitioner recognizes and exercises professional judgment within the limits of his/her qualifications and seeks counsel or makes referrals as appropriate.
10. The dietetic practitioner provides sufficient information to enable clients to make their own informed decisions.
11. The dietetic practitioner who wishes to inform the public and colleagues of his/her services does so by using factual information. The dietetic practitioner does not advertise in a false or misleading manner.
12. The dietetic practitioner promotes or endorses products in a manner that is neither false nor misleading.
13. The dietetic practitioner permits use of his/her name for the purpose of certifying that dietetic services have been rendered only if he/she has provided or supervised the provision of those services.
14. The dietetic practitioner accurately presents professional qualifications and credentials.
 - The dietetic practitioner uses "RD" or "registered dietitian" and "DTR" or "dietetic technician, registered" only when registration is current and authorized by the Commission on Dietetic Registration.
 - The dietetic practitioner provides accurate information and complies with all requirements of the Commission on Dietetic Registration program in which he/she is seeking initial or continued credentials from the Commission on Dietetic Registration.
 - The dietetic practitioner is subject to disciplinary action for aiding another person in violating any Commission on Dietetic Registration requirements or aiding another person in representing himself/herself as an RD or DTR when he/she is not.
15. The dietetic practitioner presents substantiated information and interprets controversial information without personal bias, recognizing that legitimate differences of opinion exist.
16. The dietetic practitioner makes all reasonable efforts to avoid bias in any kind of professional evaluation. The dietetic practitioner provides

objective evaluation of candidates for professional association memberships, awards, scholarships, or job advancements.

17. The dietetic practitioner voluntarily withdraws from professional practice under the following circumstances:
 - The dietetic practitioner has engaged in any substance abuse that could affect his/her practice.
 - The dietetic practitioner has been adjudged by a court to be mentally incompetent.
 - The dietetic practitioner has an emotional or mental disability that affects his/her practice in a manner that could harm the client.
18. The dietetic practitioner complies with all applicable laws and regulations concerning the profession. The dietetic practitioner is subject to disciplinary action under the following circumstances:
 - The dietetic practitioner has been convicted of a crime under the laws of the United States which is a felony or a misdemeanor, an essen-

tial element of which is dishonesty, and which is related to the practice of the profession.

- The dietetic practitioner has been disciplined by a state and at least one of the grounds for the discipline is the same or substantially equivalent to these principles.
 - The dietetic practitioner has committed an act of misfeasance or malfeasance which is directly related to the practice of the profession as determined by a court of competent jurisdiction, a licensing board, or an agency of a governmental body.
19. The dietetic practitioner accepts the obligation to protect society and the profession by upholding the Code of Ethics for the Profession of Dietetics and by reporting alleged violations of the Code through the defined review process of The American Dietetic Association and its credentialing agency, the Commission of Dietetic Registration.

The Code of Ethics for the Profession of Dietetics of The American Dietetic Association was adopted by the House of Delegates in October 1987, for implementation on January 1, 1989.

THE AMERICAN DIETETIC ASSOCIATION STANDARDS OF PRACTICE FOR DIETETICS PROFESSIONALS

Standard 1: Provision of Services

Provides quality service based on client expectations and needs

Rationale

Dietetics professionals provide, facilitate, and promote quality services based on client needs and expectations, current knowledge, and professional experience.

Indicators

Each dietetics professional:

- 1.1 collaborates with clients to assess needs, background, and resources and to establish mutual goals
- 1.2 collaborates with other professionals as appropriate
- 1.3 applies knowledge and skills to determine the most appropriate action plan
- 1.4 implements quality practice by following policies, procedures, legislation, licensure, practice guidelines, and the Standards of Professional Practice
- 1.5 fosters excellence and exhibits professionalism in practice

1.6 continuously evaluates processes and outcomes

1.7 advocates for the provision of food and nutrition services as part of public policy

Examples of Outcomes

- Clients actively participate in establishing goals and objectives
- Clients' needs are met
- Clients are satisfied with service and products provided
- Evaluation reflects expected outcomes
- Public has access to food and nutrition services

Standard 2: Application of Research

Effectively applies, participates in, or generates research to enhance practice

Rationale

Effective application, support, and generation of dietetics research in practice encourages continuous quality improvement and provides documented support for the benefit of the client.

Indicators

Each dietetics professional:

- 2.1 locates and reviews research findings for their application to dietetics practice
- 2.2 bases practice on sound scientific principles, research, and theory
- 2.3 promotes research through alliances and collaboration with dietetics and other professionals and organizations
- 2.4 contributes to the development of new knowledge and research in dietetics
- 2.5 collects measurable data and documents outcomes within the practice setting
- 2.6 shares research data and activities through various media

Examples of Outcomes

- Client receives appropriate services based on the effective application of research
- A foundation for performance measurement and improvement is provided
- Outcomes data supports reimbursement for the services of dietetics professionals
- Research findings are used for the development and revision of policies, procedures, practice guidelines, protocols, and clinical pathways
- Professionals use benchmarking and knowledge of “best practices” to improve performance

Standard 3: Communication and Application of Knowledge

Effectively applies knowledge and communicates with others

Rationale

Dietetics professionals work with and through others while using their unique knowledge of food, human nutrition, and management as well as skills in providing services.

Indicators

Each dietetics professional:

- 3.1 has knowledge related to a specific area(s) of professional service
- 3.2 communicates sound scientific principles, research, and theory
- 3.3 integrates knowledge of food and human nutrition with knowledge of health, social sciences, communication, and management theory
- 3.4 shares knowledge and information with clients
- 3.5 helps students and clients apply knowledge and skills

- 3.6 documents interpretation of relevant information and results of communication with professionals, personnel, students, or clients
- 3.7 contributes to the development of new knowledge
- 3.8 seeks out information to provide effective services

Examples of Outcomes

- Professional provides expertise in food, nutrition, and management information
- Client understands the information received
- Client receives current and appropriate information and knowledge
- Client knows how to obtain additional guidance

Standard 4: Utilization and Management of Resources

Uses resources effectively and efficiently in practice

Rationale

Appropriate use of time, money, facilities, and human resources facilitates delivery of quality services.

Indicators

Each dietetics professional:

- 4.1 uses a systematic approach to maintain and manage professional resources successfully
- 4.2 uses measurable resources such as personnel, monies, equipment, guidelines, protocols, reference materials, and time in the provision of dietetics services
- 4.3 analyzes safety, effectiveness, and cost in planning and delivering services and products
- 4.4 justifies use of resources by documenting consistency with plan, continuous quality improvement, and desired outcomes
- 4.5 educates and helps clients and others to identify and secure appropriate and available resources and services

Examples of Outcomes

- The dietetics professional documents use of resources according to plan and budget
- Resources and services are measured and data are used to promote and validate the effectiveness of services
- Desired outcomes are achieved and documented
- Resources are managed and used cost-effectively

Standard 5: Quality in Practice

Systematically evaluates the quality and effectiveness of practice and revises practice as needed to incorporate the results of evaluation

Rationale

Quality practice requires regular performance evaluation and continuous improvement of services.

Indicators

Each dietetics professional:

- 5.1 identifies performance improvement criteria to monitor effectiveness of services
- 5.2 identifies expected outcomes
- 5.3 documents outcomes of services provided
- 5.4 compares actual performance to expected outcomes
- 5.5 documents action taken when discrepancies exist between actual performance and expected outcomes
- 5.6 continuously evaluates and refines services based on measured outcomes

Examples of Outcomes

- Performance improvement criteria are measured
- Actual performance is evaluated
- Clients' outcomes meet established criteria (objectives/goals)
- Results of quality improvement activities direct refinement of practice

Standard 6: Continued Competence and Professional Accountability

Engages in lifelong self-development to improve knowledge and enhance professional competence

Rationale

Professional practice requires continuous acquisition of knowledge and skill development to maintain accountability to the public.

Indicators

Each dietetics professional:

- 6.1 conducts self-assessment at regular intervals to identify professional strengths and weaknesses
- 6.2 identifies needs for professional development and mentors others
- 6.3 develops and implements a plan for professional growth
- 6.4 documents professional development activities
- 6.5 adheres to the Code of Ethics for the profession of dietetics and is accountable and responsible for actions and behavior
- 6.6 supports the application of research findings to professional practice
- 6.7 takes active leadership roles

Examples of Outcomes

Dietetics professional uses self-reflection and feedback from a variety of sources to evaluate and implement professional change

Dietetics professional development needs are identified and directed learning takes place

Dietetics professional accepts accountability to the public

Dietetics professional obtains appropriate certifications

Dietetics professional supports legislation which promotes positive food and nutrition outcomes

Dietetics professional uses "best practices" to demonstrate competency

Dietetics professional meets Commission on Dietetic Registration recertification requirements

The Standards of Professional Practice developed by The American Dietetic Association.

LIABILITY AND MALPRACTICE

Dietitians employed across the continuum of care arguably face the highest risk of litigation among practicing dietitians. The potential for medical complications and errors in treatment and/or execution of protocols are perhaps greatest among this client population group. Understanding legal parameters of practice can greatly reduce the risk of being joined in a medical malpractice suit.

What Is Malpractice Law?

The law protects individuals from various forms of abuse and loss. Criminal laws protect citizens from crimes such as assault, battery, or burglary. Constitutional laws protect individual freedoms such as speech, sex discrimination, and due process. Property laws protect the rights of landlords, tenants, and land owners. Other laws define responsibilities for corporations, employers and employees, and persons entering contractual agreements.

An important area of the law protects individuals against injury caused by the acts of another. Called the Law of Torts, it includes personal injury, automobile liability, products liability, and professional liability (often called professional negligence or malpractice). It is a system designed not only to provide orderly and just resolution of disputes, but also to continually define and set standards for conduct that will prevent similar injuries in the future.

The basic assumption of tort law is that individuals have a duty to conduct themselves in a reasonable and prudent manner which will not result in injury or harm to others. This is called the “reasonable” or “prudent” man standard.¹ Those who fail to conduct themselves in a reasonable and prudent manner may be held to be negligent. For example, if while making routine kitchen rounds the RD/DTR knowingly allowed a piece of malfunctioning equipment to remain in use and a subsequent injury occurred, the RD/DTR could be liable for the employee’s injuries. A “reasonable” person would/should have foreseen this risk. Failure to remove this equipment from service was an act of negligence.

Some persons are held to a higher level of responsibility relative to the safety of others, either because of special expertise which they possess or because of their relationship with the other person. Professionals have both special expertise and special relationships of duties to others and are thus held to higher test of reasonable or prudent action. For example, a Certified Diabetes Educator (CDE) is assumed to have special expertise in diabetes. Failing to demonstrate that expertise or engaging in activities which interfere with that special expertise (such as using drugs prior to providing client education) could constitute professional malpractice or negligence.²

Medical malpractice is based upon these same legal principles. First, medical professionals are expected to possess special expertise within their field. Second, they enter into a special relationship of duty with those who place themselves in the care of the professional in reliance upon that expertise. The RD has both special expertise and a relationship of duty to his or her clients.

What Happens in a Medical Malpractice Suit?

That someone has been injured does not guarantee that he or she will win a medical malpractice suit. In order to prevail, the injured person, called the plaintiff, must persuade the court that all the elements of his or her case have been satisfied. If the plaintiff fails to prove any one of these elements, the case cannot succeed.

Elements which must be proven are:

- Actual injury
- A relationship of duty between the injured person and the person alleged to have caused the injury
- A breach of duty by the person alleged to have caused the injury
- A cause-and-effect relationship between the injury suffered and the act (or failure) of the injured person.

The first element is proof that there is actual injury. Probable, hypothetical, or alleged injury is not enough. In general, this is not difficult to prove. A diabetic who goes into a coma, a client with renal disease, or a client in congestive heart failure each has characteristic symptoms which can be easily documented and substantiated.

The second element of proof, a relationship of duty, is also relatively easy to establish. That a particular RD was, in fact, the person writing the diet order, giving diet instruction, or recommending formula or other supplementation to the plaintiff, is usually a matter of record. In an extended care situation, the plaintiff could produce appointment slips, diet instruction sheets signed by the RD, client record notes made by the RD, a copy of the employment contract, or other documents evidencing the relationship of duty between the RD and the client.

Next, the plaintiff must show that the RD had a duty to the client and that duty was breached. Among members of professions, duty is not defined merely by what a “reasonable man” would have done but by the “standard of care” within that profession. This standard requires that each professional in a particular field possesses and exercises that degree of care and skill that is expected of a “reasonably” competent practitioner in the same class, acting in the same or similar circumstances.³

To answer whether the standard of care has been breached, the court would first ask, "What is a reasonably competent practitioner in this field trained and qualified to do? What are his or her areas of expertise and skill and how are those generally exercised?" Most certainly the court would look to standards of practice and practice guidelines published by the profession (refer to Chapter 4), standards of governing and licensing groups, and any applicable state laws defining the practice of dietetics.

Beyond this basic definition, several other duties are implicit in the standard of care expected of RDs as well as of other health professionals. First is the duty to keep current in the science and skills of the field.⁴ The ADA, through its program of continuing education and development of competency standards, seeks to provide opportunities to assist RDs in remaining current. Colleges and universities regularly offer programs to increase expertise and keep RDs abreast of changes within the science of nutrition.

The court would inquire to what degree the RD was current in training and education. Numerous state court cases have held that it was no excuse that a health professional lived in a rural or otherwise inconvenient area for participation in continuing education activities. The availability of professional journals, audio, video, and correspondence programs, allows all professionals sufficient opportunities to remain current in their field.⁵

Finally to establish what other dietetic professionals practicing in the same or similar circumstances might have done, the courts may call upon RDs to testify. These are called expert witnesses. They may be called by either the plaintiff (in an attempt to prove that the RD acted negligently) or by the defendant (in an attempt to show that the RD followed standards of practice or care within the profession). Typically, expert witnesses are asked to carefully review the circumstances and evidence of the case and then to respond to questions from both sides (plaintiff and defendant). An expert witness does not render judgment on the accused RD — this is the responsibility of the jury — but merely provides input to help the jury weigh the degree to which, if any, the RD has been negligent in the execution of duties.

In addition to this basic standard of care, the courts hold specialists within a field to a higher standard than those who are merely general practitioners.⁶ Specialists must exhibit the same state-of-the-art scientific knowledge and skill as others who devote special study and attention to that specialty.⁷ For example, RDs specializing in diabetes or renal disease will be expected to possess a higher level of skill and knowledge relative to the nutrition needs these clients require than will a general practitioner in the field.

The last and often most difficult element of proof in a malpractice case is the issue of cause and effect. Was it in fact the RD's act or failure to act which led to the plaintiff's injury? This is a critical test, and one upon which many a malpractice suit fails. The plaintiff must prove that no other intervening event, and no act by another individual or by the plaintiff himself, has contributed to his injury. Because of the difficulty of pinpointing cause and effect in settings in which multiple persons are responsible for providing care for a client, this element often fails, at least as to the liability of any particular individual care giver. It is for this reason that plaintiffs sue not only individual practitioners but the health care agency employing them as well. Failing to single out an individual, the plaintiff who proves cause can still seek damages from the health care agency.

Note that the plaintiff is also expected to act reasonably. The law says that each person should act with common sense or as other prudent persons would have done in the same or similar circumstances.⁸ To the degree that the plaintiff's unreasonable acts contributed to the injury suffered, liability of the dietitian will be reduced.

This is rarely an issue in extended care facilities where clients generally exercise little freedom of action and, because of dementia, Alzheimer's, or other disorders, cannot be held to the "reasonable man" standard. Thus an aging diabetic suffering dementia who believes the food to be poisoned, hides it rather than eating it and goes into a diabetic coma, cannot be held to have known better.

If the plaintiff proves all of these elements he or she will prevail in the suit and be awarded damages in malpractice. Damages are generally based on the cost incurred by the plaintiff consequent to the injury such as lost wages, hospitalization and medical costs, future lost earning potential, and other costs. In addition, courts in the United States sometimes grant punitive damages above general damages awards, punish conduct involving fraud or malice, and compensate the injured for their pain and suffering. It is the latter area which accounts for the very large judgments received in medical malpractice suits.

For example, the courts might award punitive damages in a case in which a nursing home attendant withheld food and water from a client in an effort to induce certain behaviors (eg, to coerce the client to stop bed-wetting), and as a consequence that client suffered renal failure. The act by the attendant is both negligent and malicious.

The above example is not to be confused with advance directives regarding the withholding or termination of hydration and nutrition support. In the health care arena, written protocols for withholding or termi-

nation procedures which incorporate or reflect state laws, if any, governing this issue are in place. These laws are designed to protect the client, health care providers, and the state's interests in the preservation of human life, as well as the interests of heirs and others.

As a health care practitioner, you will nonetheless have to follow professional ethics and develop a system of morality that requires you to act in the highest traditions of the profession. This requires the RD/DTR to examine both the moral obligation and the ethical obligation to the client, remembering that various groups have different morals and ethics. What the health care professional may see as ethical (eg, the removal of tube feeding) may be unethical to the client's family.

Often, a request to terminate support must undergo judicial or administrative review by either a court or state-appointed advocate for the client. In general, state laws follow the test set out in the landmark case. In *re Conroy*, in which support termination was requested for an 84-year-old conscious but demented woman with severe organic brain syndrome and other health problems, the Supreme Court of New Jersey ruled⁹ that the termination of support did not constitute homicide, if one or all of the following tests were met:

- Clear and reliable evidence that the client would have chosen this (eg, existence of a living will)
- Benefit-burden analysis to judge whether the client's pain and suffering, physical pleasure, emotional enjoyment, or intellectual satisfaction are sufficiently balanced to continue life with the treatment
- Whether the net burdens of continued life clearly and markedly outweigh the benefits

In general, dietitians do not participate in these decisions unless they are members of an internal committee which reviews termination requests for the facility.

HOW CAN YOU AVOID LIABILITY?

First and foremost is possession of the requisite education, training, and experience in the field prior to engaging in professional services. While neither ADA nor most state licensure laws have established criteria for private practice, the courts would undoubtedly expect someone acting in the capacity of an RD to have at least a bachelor's degree and be registered.

Next is the need to remain current by keeping abreast of changes in the field. This might include participation in continuing education beyond that required to maintain ADA registration. For example, an RD consulting with a facility specializing in care of those with renal disease would be expected to be abreast of any changes in diet protocols for renal disease.

The various standards of practice and practice guidelines of the profession, as well as standards set by licensing and accreditation groups, such as the Joint Commission on the Accreditation of Hospitals (JCAHO), specify criteria for minimum number of site visits to facilities, menu preparation and review, diet assessment and prescriptions, and so on. To avoid negligence claims, the RD should not only follow these standards and guidelines to the letter of the law, but also document having done so. For example, when signing a contract for services with a facility, make sure that the number of site visits specified in the contract matches the number required by the licensing or accrediting agency. An administrator who asks you to agree to visit facilities once per quarter in a state that requires bimonthly site reviews is inviting you to both violate the standards of care and to risk facing a malpractice suit in the event a nutrition-related event causes harm to a client.

Neither should you spread your services so thinly that you have insufficient time to address individual client needs. Nutrition assessments of individual clients should, at a very minimum, be based on a review of the client's recorded biochemical status (eg, iron status, cholesterol level, etc), anthropomorphic measures (eg, weight loss or gain), clinical indications (eg, difficulty swallowing, persistent diarrhea, etc), and recorded or noted food intake (eg, nursing notes re: diet tolerance, quantities consumed, etc). These assessments should be reviewed periodically to determine whether any changes in the client's status merit changes in the diet regime.

The principle of "respondeat superior" offers only limited protection against liability claims. In general, this principle holds that the employer is responsible, at least in part, for negligent acts of the employee on the theory that employees are acting upon orders from their superiors. Some, albeit limited, "respondeat superior" protection may exist when the physician orders diets for clients.

However, if the diet order is in error, the courts might hold the physician negligent for such an order and the RD negligent for executing it rather than correcting the physician's error. Should you receive a diet order which you think is erroneous, immediately contact the physician by telephone to correct the error. Further, follow up your call with a note in the client's record indicating that a call was placed to the physician and write a letter to the physician stating that the order was in error and delineating the diet which you recommend. Most physicians will welcome your thoroughness, as will the facility owners, each of whom will be liable should the client suffer as a consequence of the erroneous diet order.

When charting in the client's medical records, remember the chart is a paper trail documenting the client's course from the perspective of all disciplines. Charting should be concise with recommendation supported by data. Open disagreement with other disciplines should not be documented as medical charts are open to a wide variety of interpretation.

If your plan includes suggestions for other disciplines, document how these suggestions were disseminated; do not assume the note will be read. If your plan is to submit a lengthy, typed report at a later time, make a short chart note and follow it up with the full report. Never should records be removed from the chart, taken out of the facility to be returned later, or have information entered and back dated.

SHOULD YOU HAVE INSURANCE?

Malpractice insurance is essential. One physician out of every seven in the United States has been sued in malpractice. In our increasingly litigious society, RDs face this risk as well.

The health care arena may offer to include you under the umbrella of their facility policy. However, unless you see a specific statement of coverage in your contract for services, do not assume that you are protected by their policy. Further, do not assume that the coverage provided, if any, is sufficient for your individual needs. Often a facility will limit its liability coverage for contractors to a specific level of coverage which may be lower than your coverage needs and leave you exposed.

When buying a policy, read it carefully and be familiar with the terms. Three types of information are included:

1. The amount of coverage
2. The conditions of coverage
3. The types of risks covered

The amount of damages for which you are covered will vary from one policy to another, as will the cost of providing that level of protection. Be sure that you have sufficient coverage to protect your major assets.

Conditions of coverage specify what you must do to activate coverage:

- Whether the policy is a "claims made" or "occurrence" policy. This denotes whether coverage is provided at the date of notice of a lawsuit (claims made) or at the date of occurrence of the events leading to the lawsuit occurrence.
- Whether you must give notice to the company within a specified time if you are sued in order to receive legal counsel representation and coverage. Failure to meet the time limitations specified in the policy could result in denial of coverage.
- The specific types of risks which are covered. Some policies may provide coverage if a claim is made by an outpatient client but not for claims arising from inpatient services. Some policies may provide coverage only if you were acting under the supervision of a doctor. You must read the small, fine print.

If you have questions, contact the issuing company and request clarification in writing. Do not depend on the oral statements of an agent as you will not be able to rely upon the agent later if you dispute the company's denial of coverage when a claim is made against you.

There are no guarantees against malpractice suits. The most cautious as well as the most careless of practitioners in a field are at risk. However, understanding the principles which the court will follow in adjudicating a case and following professional practices will reduce potential harm to clients and limit your liability to the very minimal of risks. As with all things in the field of health, prevention is the best protection.

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Performance Improvement and Outcomes Management

POSITIONING NUTRITION SERVICES IN TODAY'S HEALTH CARE ENVIRONMENT

Health care continues to evolve and change at an unpredictable rate. Health care professionals are continually challenged to provide high-quality services in a cost-effective manner while at the same time producing outcomes that demonstrate the appropriateness of services. Increasingly the public, employers, and administrators are requiring health care professionals to report outcomes that justify the need for services. The reality of outcomes-based practice is here.

RDs/DTRs, like many health professionals, are acknowledging the importance of tracking outcomes and measuring the quality of services. Managed care is redefining health care as it emphasizes the shift from costly acute care to a primary preventive care model. What was once defined as traditional dietetic practice is no longer the standard. RDs/DTRs are transitioning to provide services throughout the continuum, including acute care, home care, subacute care, and extended care. In any setting the documentation and demonstration of client outcomes are increasingly important. The outcomes of care guide the treatment process and demonstrate quality and accountability to case managers, administrators, payers, and physicians.

OUTCOMES MANAGEMENT

Until recently, health care has lacked consistency and accountability in regulatory enforcement. With escalating health care costs in the 1980s and inconsistencies in health care practices, the employers and insurers who pay for 70% of America's health care demanded methods and procedures that demonstrated the best practice outcomes. Recognizing this need, outcomes management is receiving greater attention. Outcomes management uses the results of outcomes research to produce methods and procedures that will improve the health and well-being of clients. A goal of outcomes management is to use gathered data to improve the perfor-

mance and quality of health care over time.¹ The key elements of outcomes management involve:

- Defining appropriate care and expected outcomes, based on data from outcomes research
- Measuring performance and outcomes
- Evaluating performance and outcomes
- Improving the process or intervention

Medical nutrition therapy (MNT) is an effective medical intervention for treating disease. It improves a variety of outcomes that health care payers are interested in for obvious reasons, including clinical outcomes and client satisfaction.

TYPES OF OUTCOMES

A clear understanding of the different types of outcomes measures is necessary for dietetics professionals to thrive in a competitive health care environment. An outcome is defined as what does or does not happen following an intervention. Outcomes are often characterized as clinical, client, functional, and cost. Outcomes evaluate the link between what happens before and after an intervention occurs.

Clinical Outcomes

Clinical outcomes define the results of an intervention. Outcomes from interventions like nutrition screening, supplemental tube feeding, or initiation of specialized enteral products can be measured. These interventions are evaluated as to whether they improved a clinical outcome. Measurable outcomes include lab values like serum albumin and weight and investigating interventions that reduce complications and infections. For example, malnourished clients are known to experience negative clinical outcomes such as slower wound healing and higher rates of mortality. Nutrition screening identifies individuals at high risk for developing malnutrition and provides opportunity for early intervention, which can improve clinical outcomes.

Client/Functional Outcomes

Client/functional outcomes define the consequences of intervention that involve clients and caregivers. These outcomes include symptom relief, perception of quality of life, changes in health status, and satisfaction with care provided. A client satisfaction survey is one way to measure these outcomes. Administrators, accrediting agencies, and payers of health care look favorably on customer satisfaction. A survey that demonstrates satisfaction can serve as a marketing tool for nutrition services or a business.

Health status is another important outcome of care. Health status instruments may be useful in screening clients for functional problems, monitoring the progression of a condition, or determining the response to a therapeutic regimen. Quality of life can be defined as clients’ perceptions of how they deal with disease or with their everyday lives when suffering from a particular condition.² However, the term “quality of life” is used inconsistently and may imply physical functioning, perceived health status, symptoms, need satisfaction, or a combination of these measures at the same time.³ Currently, experts in the field prefer the term “health status” or “functional status” to the term “quality of life” because there are differing opinions regarding the meaning. RDs/DTRs are continually challenged by health care providers and caregivers who argue a client’s health status will be compromised if specialized nutrition support is initiated. Consultants can justify interventions if they provide outcomes data showing that interventions maintain or improve a client’s functional status.

Health status can be assessed with instruments such as the Medical Outcomes Study (MOS) 36-item or 12-item short-form health survey. (Refer to Resources, page 46.) This survey can be completed in 5 to 10 minutes by most clients and is available in a number of lan-

guages. Disease-specific tools also are available. Assessment of health status includes health-related factors such as physical, functional, and emotional well-being. Health status can also include the evaluation of work-related factors, family, and other social circumstances. A variety of excellent tools are available and are well recognized in the literature. The resource list at the end of this chapter provides information on how to obtain additional information on these tools.

RDs/DTRs who provide services for extended care or home care organizations should become familiar with outcome assessment tools. The mandated assessment tool in the extended care area is the Minimum Data Set (MDS) established by the Health Care Financing Administration (HCFA).⁴ The MDS is an interdisciplinary tool that assesses areas covered in *Box 1*.

The Outcome Assessment Information Set (OASIS) is a similar tool used in the home care area. (See Resources, page 46.) OASIS, developed by Peter Shaughnessy, PhD, Center for Health Services and Policy Research, is likely to be mandated by Medicare. OASIS implements outcomes-based quality improvement by assessing outcomes measures over time. (See *Box 2*.)

Tools are also used by managed care organizations (MCOs). The PraPlus is a screening tool that assesses Medicare clients’ medical and psychosocial status and identifies high-risk Medicare clients. Through identification of high-risk clients, MCOs can predict its members’ future use of health care services and therefore provide early interventions. Many MCOs that have established Medicare risk contracts are using the PraPlus. (See *Box 3*.) This self-administered questionnaire has 17 items and has been scientifically validated at the Center on Aging at the University of Minnesota in Minneapolis. It is usually mailed to the Medicare client upon enrollment in a health plan.

BOX 1:

Minimum Data Set (MDS)

MDS assesses the following:

- Identification and background information
- Cognitive patterns
- Communication/hearing patterns
- Vision patterns
- Mood and behavior patterns
- Psychosocial well-being

- Physical functioning and structural problems
- Continence in last 14 days
- Disease diagnoses
- Health conditions
- Oral/nutritional status
- Oral/dental status
- Skin condition

- Activity pursuit patterns
- Medications
- Special treatments and procedures
- Discharge potential and overall status
- Assessment information

In addition, rehabilitation and discharge potential are evaluated.

BOX 2: Outcome Assessment Information Set (OASIS)**ITEMS INCLUDED IN OASIS - B**

- **Demographics and Patient History**

Reason for assessment
 Gender
 Race/Ethnicity
 Current payment sources for home care
 Financial factors
 Which type of facility discharged the patient
 in the last 14 days?
 Inpatient discharge date
 Inpatient diagnosis
 Medical or treatment regimen change within
 past 14 days
 Medical diagnosis
 Conditions prior to medical or treatment
 regimen change within past 14 days

Diagnosis and severity index
 Therapies the patient receives at home
 Overall prognosis
 Rehabilitative prognosis
 Life expectancy
 High-risk factors

- **Living Arrangements**

Current residence
 Structural barriers
 Safety hazards
 Sanitation hazards

PATIENT LIVES WITH:

- **Supportive Assistance**

Assisting person(s) other than home care
 agency staff

BOX 3: PraPlus

The survey has two parts. The first half consists of eight questions, the answers to which are used to calculate an individual's risk score. The second half is made up of nine questions, the answers to which provide medical, functional, and social information about a person.⁵

Check one answer.

1. In general, would you say your health is:

- ☐ 1. Excellent
- ☐ 2. Very good
- ☐ 3. Good
- ☐ 4. Fair
- ☐ 5. Poor

2. In the previous 12 months, have you stayed overnight as a patient in a hospital?

- ☐ 1. Not at all
- ☐ 2. One time
- ☐ 3. Two or three times
- ☐ 4. More than three times

3. In the previous 12 months, how many times did you visit a physician or clinic?

- ☐ 1. Not at all
- ☐ 2. One time
- ☐ 3. Two or three times
- ☐ 4. More than three times

4. In the previous 12 months, did you have diabetes?

- ☐ 1. Yes
- ☐ 2. No

5. Have you ever had:

A. Coronary heart disease?

- ☐ 1. Yes ☐ 2. No ☐ 3. Don't know

B. Angina pectoris?

- ☐ 1. Yes ☐ 2. No ☐ 3. Don't know

C. A myocardial infarction?

- ☐ 1. Yes ☐ 2. No ☐ 3. Don't know

D. Any other heart attack?

- ☐ 1. Yes ☐ 2. No ☐ 3. Don't know

continued

BOX 3: PraPlus

6. Is there a friend, relative, or neighbor who would take care of you for a few days, if necessary?

- ☐ 1. Yes
☐ 2. No

7. Please check all those conditions for which you are currently receiving medical treatment.

- ☐ 1. Breathing problems
☐ 2. High blood pressure
☐ 3. Heart problems
☐ 4. Urinary problems
☐ 5. Arthritis
☐ 6. Mental problems
☐ 7. Ankle/leg swelling
☐ 8. Cancer

Check one answer.

8. Do you live:

- ☐ 1. Alone
☐ 2. With spouse
☐ 3. With a son or daughter
☐ 4. With other family, who? _____
☐ 5. Other, explain _____

Check one answer.

9. Do you live in:

- ☐ 1. An independent house, apartment, condominium, or mobile home
☐ 2. An assisted-living apartment or board and care home
☐ 3. A nursing home
☐ 4. Other, explain _____

10. Please circle 1, 2, or 3 for each activity:

	Able to do this without help	Need some help	Cannot do this at all without help
Bathing	1	2	3
Dressing	1	2	3
Eating	1	2	3
Toileting	1	2	3
Walking	1	2	3
Taking medications	1	2	3
Meal preparation	1	2	3

	Able to do this without help	Need some help	Cannot do this at all without help
Housekeeping chores	1	2	3
Shopping and errands	1	2	3
Transportation	1	2	3
Money management	1	2	3

11. Are you currently receiving Medical Assistance or Medicaid?

- ☐ 1. Yes
☐ 2. No
☐ 3. Don't know

12. How many different prescription medicines do you take?

_____ Number of medicines

13. How is your eyesight? (This means eyesight while wearing glasses or contacts, if you use them.)

- ☐ 1. Excellent
☐ 2. Good
☐ 3. Fair
☐ 4. Poor
☐ 5. None

14. In the past 6 months, have you lost more than 10 pounds without trying?

- ☐ 1. Yes
☐ 2. No
☐ 3. Don't know

15. Do you often feel sad or blue?

- ☐ 1. Yes
☐ 2. No

16. Are you

- ☐ 1. Male
☐ 2. Female

17. What is your date of birth?

Month _____ Day _____ Year _____

Permission to reproduce the PraPlus form here has been granted by the University of Minnesota Center on Aging. However, any use of the form requires a license from the Center on Aging. Interested parties should contact the Center (University of Minnesota Center on Aging, PraPlus Licensing Program, Mayo Box 197, Minneapolis, MN 55455.)

Cost Outcomes

Cost outcomes express the monetary value of resources that are consumed or saved as a consequence of the intervention and its resulting improvement in clinical or client outcomes. The outcomes are reported as follows:

- Dollar amounts
- Ratio of cost to clinical outcome
- Ratio of cost to quality of life^{5,6}

Examples of cost outcomes are dollars saved by reducing medication dosage, eliminating unnecessary total parenteral nutrition (TPN) use, or preventing complications associated with malnutrition such as poor wound healing. Dollars saved by reduced readmission rates or need for procedures are other economic outcomes that health care payers view as valuable.

IMPLEMENTING OUTCOMES MANAGEMENT

The RD/DTR collects the data and information needed to do outcomes management daily. An outcomes project does not always involve an elaborate data collection process or require a computerized data collection system. Depending on the depth of the project, one can do an outcomes project with minimal time and financial resources. Often outcomes measurement can be successfully completed as part of an outcomes-based performance improvement plan.

It is important when initiating an outcomes project to make sure the outcome being measured is clinically relevant and has significant impact on the quality and cost of care or the service being provided. Like traditional research, a thorough literature search is necessary to critically review published reports summarizing past research, current practice patterns, and variations in practice and associated outcomes. The literature review will also summarize areas where further investigation may be needed.

Once a literature review supports the proposal for the outcomes project, it is essential to define the key outcomes or associated outcomes and the target population. Individual response to nutrition intervention can vary greatly based on comorbidities, age, gender, primary diagnosis, and disease severity. It is important to consider all of these variables when designing an outcomes project so responsiveness to an intervention is statistically comparable. Severity adjustment is an integral component of outcomes research. Classifying clients' nutritional status level is a simplified method of assessing severity of a condition. One may need to investigate various severity adjustment models and consult with a statistician, depending on the complexity of the outcomes project.

Box 4 summarizes key steps in designing an outcomes project.

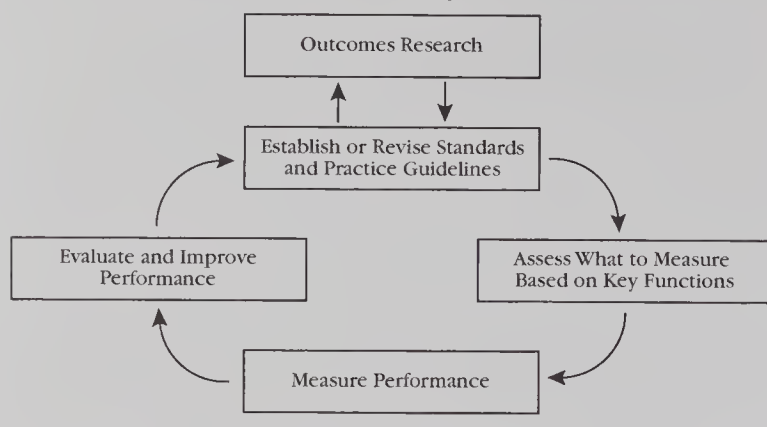
PERFORMANCE IMPROVEMENT

Figure 1 describes the relationship between performance improvement and outcomes management. As previously mentioned, outcomes management uses gathered data to improve the performance and quality of health care over time. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) defines performance improvement as the continuous study and adaptation of a health care organization's functions and processes to increase the probability of achieving desired outcomes and to better meet the needs of individuals and other users of services.⁷ The terms used to define "quality" continue to evolve with an increasing importance on outcomes. *Quality management* is the umbrella term often used to describe these terms. *Quality improvement* (QI), *continuous quality improvement* (CQI), and *performance improvement* (PI) are terms used interchangeably to describe the ongoing process of monitoring and evaluation.

BOX 4: How to Design an Outcomes Project

- Identify the disease state or condition for research and define key or desired outcomes.
- Complete a literature review.
- Select a target population, sample size, and study design (eg, descriptive, comparative). A statistician may need to be consulted.
- Design the methodology and describe specific interventions objectively.
- Identify measurement tools and standardize the tools to ensure reliability.
- Plan a procedure for documenting data accurately and involve staff.
- Summarize methods for data collection, using simple recording forms or a computer database.
- Collect valid, accurate data.
- Analyze data for effectiveness; summarize and compare results to desired outcomes.
- Use outcomes research data to revise and develop standards, guidelines, or tools.
- Share results with leaders and other disciplines of the health care industry.

Figure 1
Outcomes Management and
Performance Improvement Cycle



Quality assurance (QA) is a term used to describe the process of defining quality standards and managing operations to ensure that quality goods and services are produced. Quality assurance differs from performance improvement in that it evaluates programs separately, looking at individual errors. QA uses quality control techniques to evaluate a process based on a single measurement compared against a standard. Examples include refrigerator and freezer temperature control, equipment functioning, or following a procedure. The foodservice industry uses QA to ensure that standards and quality control are met.

JCAHO, a leader in accreditation standards and performance measurement, recognizes performance improvement as an integral component of health care quality. PI applies the fundamental elements of total quality management (TQM). Like TQM, PI focuses on the attainment of client satisfaction by providing high-quality products and services. The principles of teamwork driven by a common mission and goal are an important element. *Box 5* describes the steps of performance improvement.

Quality Improvement

- First, you measure.
- Second, you assess.
- Third, you improve.

IMPACT OF ACCREDITING ORGANIZATIONS ON QUALITY

There are numerous accreditation agencies; some are nationwide, some are state or regional. Accreditation agencies are concerned with promoting quality health care through standards, review, credentialing, and education. The move is away from departmentalization and toward integration of services. Coordination, collaboration, communication, integration, and interdisciplinary approaches describe the new focus.

The Accreditation Commission for Home Care, Inc. (ACHC) is also a private, not-for-profit corporation established in 1986 in North Carolina. In 1996, ACHC expanded nationwide. ACHC accredits multiservice Medicare-certified and noncertified home health agencies, home infusion companies, home care aide programs, home medical equipment suppliers, hospices, and others.

CARF, the Rehabilitation Accreditation Commission, is a private, not-for-profit organization established in 1966 whose mission is to promote quality services for people with disabilities and others in need of rehabilitation. CARF has accredited over 11,000 programs since its inception. In addition, government and private entities have adopted expectations, mandates, and/or endorsements of CARF accreditation.

JCAHO continues to grow and expand, accrediting hospitals, home care agencies, long-term care, behavioral health care, ambulatory, laboratory, and network services. To modernize the accreditation process and allow for the opportunity to embrace continuous quality improvement principles, JCAHO implemented *The Agenda for Change*.^{7,8} As a result, the accreditation standards instituted by JCAHO have been consolidated and now place more emphasis on the quality and the outcomes of client care. The

BOX 5: Steps of Performance Improvement

- Identify your primary customer.
- Consult your primary customers to identify their service needs and expectations.
- Determine what processes and outcomes meet customer expectations.
- Identify key standards.
- Determine the processes and outcomes that meet standards.
- Identify key quality indicators and the basis for measurement.
- Establish performance measurement criteria for quality indicators.
- Monitor actual performance and compare to standards.
- Give feedback to service providers.
- Make corrections and improvements using the organization's process improvement approach.

accreditation manual has been reformatted and organized to include both organizational and patient key functions common to all health care organizations. (See *Box 6*.)

Specific standards related to nutrition care have been adopted and are part of the major key functions found in accreditation manuals in all settings. Nutrition care standards target the following care processes:

- Screening, assessing, and reassessing nutrition needs
- Planning for MNT
- Prescribing food and other nutrients
- Preparing, distributing, and administering food and other nutrients
- Monitoring the response to nutrition care

These changes have provided a window of opportunity for the RD/DTR. With the adoption of nutrition care standards in the areas of acute care, home care, long-term care, and subacute care, registered dietitians are needed in these practice settings to provide ongoing nutrition consultation and leadership to organizations seeking accreditation. The registered dietitian provides skills that will ensure standards are met appropriately.

JCAHO also can assist with deemed status. Organizations wishing to receive Medicare or Medicaid reimbursement must first be surveyed and certified by a state agency that they comply with the conditions for coverage set forth by HCFA. Deemed status occurs when JCAHO provides HCFA reasonable assurance that the organizations it accredits meet the federal conditions for coverage. If HCFA deems the organization as meeting the certification requirements, it would not be required to undergo the state agency certification.

BOX 6: Examples of Key Functions

Patient care key functions include:

- Assessment of patients
- Care of patients
- Education of patients and family
- Patient rights and organization ethics

Organization key functions include:

- Improving organization performance
- Leadership
- Management of the environment of care
- Management of human resources
- Management of information

PERFORMANCE MEASUREMENT

As shown in the performance improvement cycle in *Figure 1*, performance measurement is the component of the cycle that actually measures the outcomes so practice methods can be evaluated. Performance measurement provides the data necessary to continuously improve the way a task or procedure is done.

JCAHO defines performance measurement as an interrelated set of processes, outcome measures, or both, which facilitate internal comparisons over time and external comparisons of an organization's performance.⁷ Increasingly the health care industry is using standardized performance measures to obtain comparative quality data. JCAHO will be using performance measurement data by incorporating it into the survey and accreditation decision processes, and as a way to monitor an accredited organization's performance between on-site surveys.

Performance Measures

A performance measure is a standard or indicator used to assess the performance of a function or process. An indicator is a tool used to measure, over time, the performance of functions, processes, and outcomes. Simplified, an indicator is an observable or measurable form of an outcome. For example, when providing MNT to clients with unintentional or significant weight loss, the desired outcome is weight gain or, measured in quantitative terms, pounds gained. An indicator will measure the percentage of weight gain or change in weight from baseline when nutrition intervention is provided.

The desired outcome for nutrition education is for the client to learn a specific behavior to change eating patterns. The nutrition education campaign, "Five a Day," is clearly linked to the desired outcome of increasing the number of servings of fruit and vegetables consumed per day by Americans. An indicator would measure the number of fruits and vegetables consumed after education was provided. The data collected from the indicator help to assess if consumption patterns change over time. The data obtained from the indicator assist in evaluating the effectiveness of the education campaign. If the desired outcome is not achieved, the education program may need to be redesigned to achieve the desired outcome.

TYPES OF INDICATORS

There are two primary types of indicators: sentinel event indicator and comparative rate based. A sentinel event indicator measures a serious event that has direct negative implications on client outcomes. The event is avoidable and requires review of every incident. Examples of sentinel event indicators may include on-

the-job injuries, food-borne illness, or a client who is to receive no oral feeding (NPO) and identified as malnourished and not given nutrition support. A comparative rate base indicator measures or expresses information as an event or ratio (rate) of events within a defined sample. A comparative rate base indicator is generally expressed with a numerator and denominator. For example:

Numerator:	Number of clients for whom the indicator event occurs
Denominator:	Number of clients who have a specified condition or procedure

Example 1:
$$\frac{\text{Number of clients at high nutrition risk receiving nutrition intervention}}{\text{Number of clients screened at high nutrition risk}}$$

or

Example 2:
$$\frac{18 \text{ high-risk clients receiving nutrition intervention}}{40 \text{ clients screened at high nutrition risk}}$$

This example provides a rate or ratio of 45% receiving nutrition intervention.

The data generated from the indicator are normally compared to a threshold. The threshold is the level or points at which intensive evaluations are triggered. When determining the threshold or percentage, 100% is ideal but rarely possible. Generally, less than 50% will trigger the need for further assessment or investigation. In the above example, if only 45% of high-risk clients were receiving nutrition intervention, the RD would want to investigate the reasons and improve the number of clients receiving interventions.

Benchmarking uses the outcomes of best practices as performance goals. A benchmark is the actual goal and can be obtained from local, state, or federal averages, industry norms, baseline data, or internal organization standards. Frequently the goals set forth by Healthy People 2000⁶ are used as a benchmark. A practice guideline can serve as a benchmark. The Diabetes Care and Education Practice Group of The American Dietetic Association determined that care provided to Type 1 diabetics using a defined practice guideline caused a 0.5% to 1.0% drop in glycated hemoglobin. This can serve as a benchmark when determining expected goals of therapy.

Events Indicators Measure

There are three types of events indicators measure:

1. Structure
2. Process
3. Outcome

A structure indicator measures whether or not an organization's resources are in place to deliver health care. These may include appropriate staffing levels, client/staff ratios, wait times for care, and competency of caregivers directly managing high-risk clients or specialized procedures. An example could include the caregiver's availability during feeding times, number of therapists available to assist clients with feeding skills, or ratio of high nutritional risk clients seen by an RD.

A process indicator measures a care activity and is linked to client outcomes. It relates to activities performed in giving and receiving care; these include monitoring, assessing, treating, and indicating need for therapy. The following is a common process indicator that is collected as a result of JCAHO standards:

Example:

$$\frac{\text{Number of home care clients screened for nutrition risk within 48 hours}}{\text{Number of home care client admissions}}$$

Outcome indicators are the indicators of choice in the present health care environment. Outcome indicators measure what happens or does not happen after an intervention. As discussed in the outcomes management section, outcomes can be clinical, client/functional, or cost.

Example:

$$\frac{\text{Number of clients with Type 2 diabetes who will have baseline glycated hemoglobin and a follow-up measure that demonstrates a 3% to 5% decrease in 3 to 6 months after nutrition therapy}}{\text{Number of clients with Type 2 diabetes having a baseline and follow-up glycated hemoglobin}}$$

In summary, indicators should be identified for each relevant key function. Indicators should be objective and measurable and should help trigger problems or identify opportunities to improve care. RDs/DTRs need to align service performance improvement activities and monitoring efforts with those of the organization and the needs of external governing bodies. Measuring efforts should parallel the organization's mission, goals, and performance improvement plan. The dietetics professional should organize priorities for measurement around the following three key areas:

1. Customer satisfaction
2. Activities that impact a large number of clients
3. High-risk and high-cost conditions

The goal of the process is to improve client care. Collaborating with other disciplines and getting buy-in from staff are necessary for successful implementation. It is important to recognize that a few relevant performance measures are better than several irrelevant measures that will not produce useful data.

PERFORMANCE MEASUREMENT: A NATIONAL STANDARD

Recently, JCAHO has moved to integrate accreditation with performance measurement. ORYX: The Next Evolution in Accreditation moves beyond compliance to performance standards for accreditation. ORYX will require health care organizations to collect and analyze data on performance measures. To become accredited or maintain accreditation status, organizations must now share performance measurement data with JCAHO on a quarterly basis. Initially, organizations must select from a list of approved performance measurement systems. Once a system is selected, the organization must identify a minimum of two performance measures that relate to at least 20% of its client population and will build upon future improvement efforts. For example, if an organization primarily services older adults, the measures may focus on high-risk screening, percentage of clients with malnutrition, or percentage of readmission to acute care. The number of indicators required will gradually increase over the next several years.

Other accrediting organizations are emphasizing the relevance and need for performance measurement. For instance, the National Committee for Quality Assurance (NCQA), known as the leading accrediting agency for health maintenance organizations, collaborated with other organizations and government agencies to develop the Health Plan Employer Data and Information Set (HEDIS). (See Resources, page 46.) HEDIS is a set of 100 performance measures with which managed care organizations can track performance and stimulate quality improvement activities. It standardizes health plan measurement in the following areas:

- Effectiveness of care
- Access/availability of care
- Satisfaction with the experience of care
- Health plan stability
- Use of services
- Cost of care
- Informed health care choices
- Health plan descriptive information

There is increased emphasis on preventive care versus acute and crisis treatment. Examples of performance measures found on the current HEDIS under the domain of effectiveness of care include the management of cholesterol levels, prenatal care, and health maintenance of seniors. HEDIS includes measures for Medicare and Medicaid clients. Organizations wanting to secure Medicare risk contracts or to provide services to Medicaid clients are now mandated to report HEDIS data by several states and HCFA. The RD/DTR must become familiar with HEDIS requirements as many home care, extended care, and ambulatory services are provided under the auspices of a managed care model. The RD should market his or her ability to provide a service that will assist in collecting performance measurement data for HEDIS or JCAHO when negotiating contracts with payers and administrators.

JCAHO supports the National Library of Healthcare Indicators (NLHI). NLHI provides a sophisticated classification system and individual profiles for 225 performance measures that can be used to assess the performance of health plans, integrated delivery networks, provider-sponsored organizations, and other emerging delivery system forms. The ADA submitted nutrition indicators specific to ambulatory, home care, long-term, and behavioral health care to be included in the second edition of the NLHI. These indicators focus on both processes and outcomes of MNT and assess areas related to nutrition adequacy, timeliness of nutrition intervention, and effectiveness of MNT.

QUALITY TOOLS

As health care continues to shift, so will jobs for dietetics professionals. As job settings change, so will the methods of practice. Continuously evaluating and refining practice methods leads to the development of practice models often referred to as practice guidelines. Practice guidelines, MNT protocols, and standards of practice are among the necessary quality tools used to build a strong foundation for practice. Accrediting agencies are encouraging the use of these tools to ensure that practitioners use a consistent standard of care and to minimize variations in practice. These tools can also assist in collecting outcomes data.

Practice guidelines are systematically developed statements or specifications designed to assist the health care provider and client in choosing appropriate health care. Practice guidelines are generally developed at a national level and adapted to meet the needs of providers on the local level. Practice guidelines are based on peer-reviewed research and are often field tested to ensure validity and reliability. A variety of Dietetic Practice Groups (DPGs) of ADA have published practice guidelines. See *Box 7* for a list of practice guidelines available.

BOX 7: Current ADA and DPG Quality Improvement Projects**Standards of Practice**

Standards of Practice for Gerontological Nutritionists: A Mandate for Action.

[*J Am Diet Assoc.* 1995;95(12):1433-1438]

National Standards for Diabetes Self-Management Education — Task Force to Revise the National Standards.

[*Diabetes Care.* 1995;95(suppl 1):94-96]

Standards of Practice Criteria for Clinical Nutrition Managers. Clinical Nutrition Management.

[*J Am Diet Assoc.* 1997;97(6):673-678]

Standards of Practice for the Consultant Dietitian. Consultant Dietitians in Health Care Facilities DPG.

[*J Am Diet Assoc.* 1993;93(3):305-308]

Standards of Practice for the Nutrition Support Dietitian. Dietitians in Nutrition Support DPG (Joint Project

with ASPEN). [*J Am Diet Assoc.* 1993;93(10):1113-1116]

Standards of Practice for the Profession of Dietetics. [*J Am Diet Assoc.* 1985;85(6):723-726]

Practice Guidelines

Professional Performance Standards for Gerontological Dietitians Practicing in Specific Settings. Project Alliance with the Administration on Aging. [Project approved June 1996; in progress]

Practice Guidelines for the Care of Renal Patients. 3rd ed. [Project approved June 1996; in progress]

Guidelines of Practice for Dysphagia in Rehabilitation. Dietetics in Physical Medicine and Rehabilitation DPG. [Published by ADA, ©1996]*

Nutrition Practice Guidelines for Type I & Type II Diabetes Mellitus. Diabetes Care & Education DPG. [Published by ADA, ©1996]*

Practice Guidelines for Medical Nutrition Therapy Provided by Dietitians for Persons with Non-Insulin-Dependent Diabetes Mellitus. Diabetes Care & Education DPG (Joint Project with IDC).

[*J Am Diet Assoc.* 1995;95(9):999-1006]

Suggested Guidelines for Nutrition and Metabolic Management of Adult Patients Receiving Nutrition Support. Dietitians in Nutrition Support DPG. [Published by ADA, ©1993]*

Suggested Guidelines for Nutrition Care of Renal Patients. 2nd ed. Renal Dietitians DPG. [Published by ADA, ©1992]*

Nutrition Practice Guidelines for Gestational Diabetes Mellitus. Diabetes Care & Education DPG. [Project approved March 1997, anticipated publication date January 1999]

Nutrition Practice Guidelines for Dysphagia. Dietetics in Physical Medicine and Rehabilitation DPG. [Published by ADA ©1996]*

continued

BOX 7: Current ADA and DPG Quality Improvement Projects**Clinical Indicators, Protocols, and Other QI Projects**

Patient Acuity Clinical Staffing Study. Clinical Nutrition Management DPG.
[www.eatright.org/qm/tools.html]

Documenting Nutrition Care: Are We Prepared for Our Future Practice? Clinical Nutrition Management DPG and Dietitians in Nutrition Support DPG. [Approved December 1994. *J Am Diet Assoc.* 1997;1099-1104]

Medical Nutrition Therapy Across the Continuum of Care. Joint project with Morrison's Health Care Inc. [Published by ADA, ©1996]* Provides the tools to communicate the benefits of medical nutrition therapy to other health care professionals and managed care organizations. Includes 12 adult disease-specific protocols. 3 1/2" PC disk and a 30-minute video.

Clinical Indicators Associated with Unintentional Weight Loss and Pressure Ulcers in Elderly Residents of Nursing Facilities. Consultant Dietitians in Health Care Facilities DPG and Dietitians in Nutrition Support DPG. [*J Am Diet Assoc.* 1995;95(9):984-992]

Clinical Indicators for Oncology, Cardiovascular and Surgical Patients. [*J Am Diet Assoc.* 1993;93:338-344]

Quality Assurance Criteria Sets for Pediatric Nutrition Conditions (includes supplements). Dietitians in Nutrition Support DPG. [Published by ADA, ©1988, 1990, 1993]*

Enteral Practitioner Cards. Dietitians in General Clinical Practice DPG. [Approved 1996; in progress]

Parenteral Practitioner Cards. Dietitians in General Clinical Practice DPG. [Published by ADA and Mead Johnson, 1997]*

Supplement to Medical Nutrition Therapy Across the Continuum of Care. Joint Project with Morrison Health Care Inc. Consultant Dietitians in Health Care Facilities DPG, Pediatric Nutrition DPG, Perinatal Nutrition DPG, and Dietitians in Nutrition Support DPG. [Published by ADA, 1997].* Includes nine additional MNT protocols for various age groups and settings: Anorexia and Bulimia Nervosa/Adolescent and Adult, Congestive Heart Failure/Adults, Enteral Feeding Support/Adults, Hyperemesis Gravidarum/Adults, Parenteral (PEN) Feeding Support/Adults, Pediatric Failure-to-thrive (0-7 years), Pressure Ulcer/Older Adults, Prevention of Unintentional Weight Loss/Older Adults, Weight Management/Adults.

Guidelines for a Standard Documentation System for Clinical Dietitians. Dietitians in Nutrition Support and Clinical Nutrition Management DPGs. [Approved 1994; in progress]

Professional standards of practice differ from regulatory standards because they are generalized statements that describe the values and services provided by a profession or group. Standards of practice are statements of the dietetics professional's responsibility for providing nutrition care. Standards of practice serve as a blueprint for ensuring quality services and assist the professional in directing and evaluating practice.

MNT protocols use practice guidelines and outcomes research as a basis for demonstrating results. MNT protocols are tools that define the level, content, and frequency of nutrition care that is appropriate for a specific disease or condition. Protocols are organized in a format that helps guide clinicians in collecting data on the clinical, functional, and behavioral outcomes of MNT. Protocols are the tools that are shared with man-

aged care organizations, case managers, or administrators when securing coverage of MNT. These groups are interested in protocols because they provide concrete information, like the number of visits required to produce an expected outcome. ADA, along with Morrison Health Care Inc. and DPGs, has taken the lead and published two sets of MNT protocols that can be used to manage leading clinical disease states like diabetes and cardiovascular disease. The Consultant Dietitians in Health Care Facilities Dietetic Practice Group (CD-HCF) developed two of the protocols — pressure ulcer management and unintentional weight loss for older adults. See *Figures 2 and 3.*

Figure 2

PRESSURE ULCER (Stage I-IV)**Medical Nutrition Therapy Protocol****Setting: Home Care/Long-Term Care (Adults 55+ years)****Number of sessions: 4** - Number of visits and intensity of treatment may vary based on severity of pressure ulcer.

No. of interventions	Length of contact	Time between interventions	Cost/charge
1	60 minutes	2-4 weeks	
2	30 minutes	2-4 weeks	
3	30 minutes	2-4 weeks	
4	30 minutes	2-4 weeks	

Expected Outcomes of Medical Nutrition Therapy

Outcome assessment factors	Base- line	Evaluation of Intervention				Expected outcome	Ideal/goal value
	Interventions						
	I	2	3	4			
Clinical Outcomes - Biochemical measure (within 30 days of session) Albumin Hgb Hct - Anthropometrics Weight, ideal body weight (BMI) - Clinical signs/symptoms of stage I, II, III or IV pressure ulcers	✓ ✓ ✓ ✓	 ✓	 ✓	✓ ✓ ✓ ✓	Improve, achieve, or maintain appropriate biochemical values when properly hydrated ↑ or maintain as appropriate Hydrated, wound status improved, healing without further breakdown	Albumin >3.5 g/dL Hgb 11g/dL Hct 33% Avoids weight loss: ≥5% in 30 days or ≥10% in 6 months	
Functional Outcomes - ADLs/IADLs - Braden Scale Score - Incontinence/urinary/fecal (Is and Os) - Chewing/swallowing problems	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	Able to feed self and/or assisted to eat, ↑ mobility/activity level ↑ Score ↓ Incontinence (eg, bowel/bladder training) Consumes food/fluid appropriate for condition	Consumes nutrition as prescribed Braden Score 17 or higher ↑ mobility/activity based on health condition of client Incontinence controlled to prevent further skin breakdown Achieves or maintains adequate nutrition and hydration	
Quality of Life (QOL) Evaluation	✓	✓	✓	✓	Improve QOL	Improve QOL appropriate to client	
Behavioral Outcomes* - Oral intake adequate in protein, calories, fluids, vitamin C, zinc - Knowledge of food/drug interaction - Review appropriate care/treatment as prescribed	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	Consumes adequate nutrients to heal wound Consumes food and drugs at appropriate times and amounts Wound care with adequate nutrition heals wound	MNT Goals: 1.25-1.50 g total protein/kg BW (70% high biological value) - Minimum 30-35 mL/kg BW - No evidence of food/drug interaction	

*Session in which behavioral topics are covered may vary according to client's readiness, skills, resources, and need for lifestyle changes.

Figure 3

PREVENTION OF UNINTENTIONAL WEIGHT LOSS**Medical Nutrition Therapy Protocol****Setting:** Ambulatory, Home Care, Long-Term Care, and Disease State Management (Adult 55+ years)**Number of sessions:** varies with progress of client.

No. of interventions	Length of contact	Time between interventions	Cost/charge
1	60 minutes	2 - 4 weeks	
2	30 minutes	2 - 4 weeks	
3	30 minutes	2 - 4 weeks	

Expected Outcomes of Medical Nutrition Therapy

Outcome assessment factors	Base- line	Evaluation of Intervention		Expected outcome	Ideal/goal value
	Interventions				
	1	2	3		
Clinical Outcomes					
• Biochemical parameters (within 15 days of session)	✓			Labs repeated based on client’s condition	Albumin 3.5 g/dL HgB 11g/dL Hct 33% BUN 8-20 mg/dL Creatinine 0.7-1.5 mg/dL
Albumin	✓				
HgB, Hct	✓				
BUN	✓				
Creatinine					
• Anthropometrics	✓	✓	✓	Weight ↑ or maintain as appropriate	Maintain weight to >85% usual body weight
Weight and height					
Body mass index (BMI)					
• Hydration status	✓	✓	✓	Prevent dehydration/edema	
• Blood pressure (BP)	✓	✓	✓	Within normal limits of client history	BP <120/80 mm Hg
Functional Outcomes					
• ADLs	✓	✓	✓	ADLs maintained/improved	Able to participate in exercise appropriate for tolerance
• Exercise tolerance	✓	✓	✓	↑ Mobility/activity level	
• Demonstrates self-feeding skills	✓	✓	✓	Maximizes food intake through cueing, self-help devices, or feeding assistance	
Quality of Life (QOL) Evaluation	✓	✓	✓	Improve QOL	Improved QOL appropriate to client
Behavioral Outcomes*					MNT Goals
• Food/meal planning	✓	✓	✓	• Consumes nutrient-dense foods and snacks/supplements, > 30-35 kcal/kg	• Increase intake of nutrient-dense foods
				• If necessary, alternative nutrition support provided to prevent further weight loss and reduce complications	• Maintain /increase weight gradually
• Vitamins/mineral supplements w/acceptable doses, if required	✓	✓	✓	• Free from signs/symptoms of vitamin/mineral deficiencies	• Prevent complications associated with low body weight, medication noncompliance, vitamin/ mineral deficiencies
• Tolerates consistency of foods served	✓	✓	✓	• Consumes 90-100% of meals, snacks, and supplements without distress	
• Knowledge of food/drug interactions	✓	✓	✓	• Dietary adjustment made for food and drug interaction	

*Session in which behavioral topics are covered may vary according to client's readiness, skills, resources and need for lifestyle changes.

SUMMARY

Dietetics professionals who participate actively in outcomes management will be rewarded. Information obtained from outcomes research will support and substantiate practice. Outcomes management will help to:

- Determine and identify the best practice methods
- Substantiate the cost-effectiveness of nutrition interventions
- Establish the foundation for practice guidelines, clinical/critical pathways, and MNT protocols
- Shape the best methods for continuous performance improvement
- Establish benchmarks

Outcomes management will provide the necessary vehicle for communicating the benefits of MNT to decision makers and health care payers.

RESOURCES

SF-36 Health Survey and SF-12 Health Survey:

The Health Institute at New England Medical Center
Health Care Assessment Lab
The Health Institute NEMC #345
50 Washington Street
Boston, MA 02111
Phone: 800/572-9394
e-mail: www.sf-36.com

Quality of Well-being and Sickness Impact Profile
Instrument:

Medical Outcomes Trust
PO Box 1917
Boston, MA 02205
617/426-4046

Outcome Assessment Information Set (OASIS):

Center for Health Services and Policy Research
1355 S. Colorado Boulevard Suite 306
Denver, CO 80222
303/756-8350

PraPlus Medicare Risk Screening Instrument:

The PraPlus Licensing and Distribution Office
The University of Minnesota Center on Aging
420 Delaware Street, SE
Minneapolis, MN 55455
612/627-4462
e-mail: coa@tc.umn.edu

National Committee for Quality Assurance

2000 L Street NW Suite 500
Washington, DC 20006
202/955-3500
Web site: www.ncqa.org

Joint Commission on Accreditation of Healthcare
Organizations

Web site: www.jcaho.org
630/792-5800

Health Care Financing Administration

Web site: www.dhhs.gov
(Healthy People 2000 objectives can be accessed.)

SUGGESTED READING

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5 CHAPTER

Quality of Life

To grow old is to change, to change is to be new, and to be new is to be young again.

— John Denver

THE EDEN ALTERNATIVE

Ensuring and enhancing the quality of life for each client served across the continuum of care is a primary responsibility of all caregivers. Recognizing the individuality of each client and respecting his or her identified needs are fundamental. Just as The Eden Alternative is revolutionizing the atmosphere and environment in extended care, so should the RD/DTR advocate changes in the nutrition care offered to clients to improve overall nutritional status and quality of life.¹

The Eden Alternative is based on the assumption that improving the client's quality of life in extended care means that we must resolve the confusion that exists in the medical model's fixation on diagnosis and treatment. The Eden Alternative strives to reduce the loneliness, helplessness, and boredom that steadily decay the client's spirit by employing the principles of ecology and anthropology:

- Songs of birds
- Tanks of fish
- Pets
- Echoes of children's laughter
- Tender shoots of green, growing plants

Clients are encouraged to continue to grow by becoming involved as they choose. Caregivers are encouraged to participate as they wish.²

Defining "quality of life" is difficult because individual perceptions vary due to a wide diversity of life experiences. Level of satisfaction reflects the individual's perception of his or her life or surroundings.

In one survey sponsored by a professional organization to measure satisfaction with services offered, a group of older adults defined "quality of life" as including both health status (absence of disease) and social

contacts.³ Good health and quality of life are positive feelings. These feelings encompass personal and social well-being including:

- Intellectual ability
- Capacity to perform activities of daily living (ADL)
- Freedom from pain and suffering
- Preservation of senses and sensuality
- Social support system
- Adequate financial base
- Mastery over one's life
- Independence
- Autonomy
- Choice
- Sense of usefulness
- Some degree of happiness and morale⁴

OMNIBUS BUDGET RECONCILIATION ACT

The Omnibus Budget Reconciliation Act of 1987 (OBRA) emphasizes quality of life issues by empowering extended care clients with choices focused on delivery of care and the resulting outcomes. It is essential that the health care team, including the RD, take a proactive role in assessing individual needs. OBRA regulation (483.15) reads:

A facility must care for its residents in a manner and in an environment that promotes maintenance or enhancement of each resident's quality of life.⁵

HOME CARE

While home care regulations do not stipulate quality of life requirements, they are implied in the requirement for services that must be offered by certified home care agencies to meet the needs of clients covered under Medicare. The Outcome Assessment Information Set

(OASIS) was designed by the Health Care Financing Administration (HCFA) to improve outcome-based quality for home health care under Medicare.^{6,7} (See Chapter 4.)

RD/DTRs have the responsibility to promote high-quality nutrition care, eliminating or reducing malnutrition among clients served in the home setting. Numerous factors need to be considered when providing quality nutrition care for the older adult including the following:

- Ethnic, social, and religious eating patterns
- Medical coverage available
- Budget limitations
- Emotional, physical, and biological changes in the client's lifestyle (ie, loss of a spouse, separation from family and friends, leaving home and job, decreased mobility, financial limitation, and loss of independence)

The unavoidable effects of aging can rob a client of the simple pleasures of eating. Sensory changes in taste, smell, hearing, sight, and touch can diminish his or her enjoyment of meals as well as increase the risk of compromising nutritional status. Frequently, favorite foods of the past no longer have the same appeal. Lack of strength often causes a weakened ability to grasp and hold utensils and dishes. Impaired vision reduces appetite stimulation and anticipation of a pleasurable meal. Depression, which is prevalent in the older adult population, can decrease the desire to eat and lead to anorexia.⁸⁻¹¹ These impairments must be considered when planning nutrition services to meet older clients' nutrition needs or to enhance their quality of life.

The RD/DTR is challenged to provide positive, creative approaches to managing nutrition, ever mindful of the client's happiness and peace of mind. Attractive and appealing meals served on schedule in a pleasant, relaxed atmosphere with adequate time to eat and socialize enhance the general well-being of the client. This kind of environment maximizes the quality of life and preserves the dignity of the client.⁹

Further information on the nutrition assessment process, working with eating-disabled older adults, and care planning can be found in Chapters 14-16.

LIBERALIZING APPROACHES TO DIET MODIFICATION

Diet orders that impose severe restrictions and deny favorite foods can contribute significantly to a reduced food intake, a marked decline in nutritional status, and diminished quality of life. Therefore, over the past decade many health professionals have encouraged liberalization of therapeutic diets.¹²⁻¹⁵

To provide adequate nutrition, thus preventing/correcting malnutrition, extended care facilities now serve the regular menu to all clients, with appropriate texture

modifications accommodated as needed. Regular menus are generally consistent in energy and served at routine times, although portions may need to be adjusted to meet the energy needs of the client. Increased quality of life, heightened satisfaction, improved nutritional status, and decreased feelings of isolation are potential benefits to residents with this approach.¹⁶

The ADA's position paper *Liberalized Diets for Older Adults in Long-term Care* states¹⁵:

It is the position of The American Dietetic Association (ADA) that the quality of life and nutritional status of older residents in long-term-care facilities may be enhanced by a liberalized diet. The Association advocates the use of qualified dietetics professionals to assess, monitor, and evaluate the need for medical nutrition therapy according to each person's needs and rights.

These recommendations, coupled with research about the aging process and disease, indicate that adequate diet is a key factor in maintaining good health. However, unless the client consumes the food served, no benefit is derived.^{5,9} Diets that are too restrictive add to the client's already existing problems. Simple adjustments and minimal restrictions are appropriate for some, although in certain medical conditions, diet modifications may still be required.

When a therapeutic diet is recommended, the RD should encourage the physician to carefully weigh the potential benefits of such a diet. The consequences of restricting certain foods must be considered; stress, anger, anxiety, and depression may result in negative outcomes. Two questions should be answered:

1. Will the diet contribute to overall health and quality of life, or will it lead to loss of appetite and malnutrition instead?
2. Are the client's rights being acknowledged, or is the client being deprived of familiar, well-liked foods for reasons that are vaguely defined?"⁵

Dietetics professionals have noticed similar positive results when liberalized diets are implemented in extended care facilities. No significant changes in blood pressure, weight, blood glucose, or edema are noted following the removal of most therapeutic diets and diet restrictions.^{14,15} Most clients' needs are met by planning a well-balanced, regular diet to satisfy individual nutrition needs and personal food preferences.¹⁶ Removing salt packets or table salt from a client requiring sodium restriction is usually adequate.

Particular foods should not be restricted in the name of good nutrition care.^{5,9} Constant monitoring and frequent reassessment of nutritional status are necessary to ensure the nutritional adequacy of intake. John E. Morely, MB, BCh, of St. Louis University's Division of

Geriatric Medicine, states, “Don’t try to change lifestyle eating habits in the nursing home. Give them what allowed them to get to their 70’s and 80’s and [what will allow them] to enjoy their twilight years.”¹¹

FEEDING THE TERMINALLY ILL

When discussing quality of life, it is important to consider issues in feeding the terminally ill adult. Ethical, legal, medical, and nutritional issues to be considered when deciding to provide or forego nutrition support are identified in the *Position of The American Dietetic Association: Issues in Feeding the Terminally Ill Adult*.¹⁷

CLIENTS’ RIGHTS AND RESPONSIBILITIES RELATED TO NUTRITION CARE

All clients have rights guaranteed under federal, state, and accrediting agency rules and regulations. The intent of these rules and regulations is to recognize and respect the client’s rights and to insure that care is provided according to each individual’s needs.

The following is a list of clients’ rights and responsibilities relating to nutrition care.

A client has the following rights^{6,18}:

- To be treated with dignity and self-respect
- To be involved in his/her care and/or services
- To make informed decisions regarding care and services
- To be involved in resolving conflict about care and services
- To be involved in resolving ethical issues
- To formulate advance directives
- To have complaints heard, reviewed, and, if possible, resolved
- To confidentiality
- To privacy and security
- To have his/her property respected
- To prompt and orderly transfer to another organization or level of care or service
- To receive reasonable accommodation of individual needs and preferences, except when health or safety or the health and safety of other clients would be endangered
- To choose activities, schedules, and health care consistent with individual interests, assessments, and plan of care

Rights specifically related to nutrition care¹⁸:

- To be served nourishing, palatable, well-balanced meals that meet daily nutrition and special needs

- To be served food according to ethnic, cultural, or religious customs
- To make choices about where, when, and what to eat
- To be provided adequate fluids to maintain proper hydration and care
- To participate in the planning of menus and special meals as desired
- To have meals served in a cheerful, relaxed, quiet, pleasant surrounding that is well-lit, ventilated, adequately furnished, and has sufficient space for safety and comfort
- To be encouraged and allowed to remain independent in feeding oneself
- To be provided with adaptive eating devices to assist in maintaining independence in eating
- To receive assistance, encouragement, and prompting during a meal as appropriate to ensure adequate nutrition intake
- To receive prompt assistance with feeding when the meal is served if unable to feed oneself
- To enjoy a dignified dining setting regardless of ability to feed oneself. (A client with dysphasia should have the same dining atmosphere as other clients.)
- To be allowed time to complete meals without feeling rushed
- To be served food that has been prepared under sanitary conditions and served at the proper temperature
- To be provided texture of food at the highest level tolerated. (This may mean varying the texture at different meals depending on the client’s alertness, fatigue, or personal preference and the particular food item.)
- To be served attractive, well-seasoned food in acceptable portions
- To be offered substitutes of similar nutritive value when food served is refused
- To have the availability of seconds on food if desired and allowed
- To be served within a reasonable time of scheduled meal services
- To participate in choosing dining companions to enhance socialization during meals
- To be seated at a table of appropriate height for proper positioning
- To be taken to the dining room appropriately groomed (hair combed, face and hands washed) and clothed

- To receive additional nutrition support appropriate for maintaining acceptable parameters of nutritional status such as body weight and protein levels, unless the client's clinical condition demonstrates it is not possible
- To receive a therapeutic diet when there is a medical problem dictating adjustment from the regular diet
- To receive necessary nutrition support to promote healing and prevent infection of pressure ulcers, and to prevent new sores from developing
- To receive the appropriate treatment and services to prevent aspiration pneumonia, diarrhea, vomiting, dehydration, metabolic abnormalities, and nasopharyngeal ulcers when nasogastric or gastrostomy tube feeding is required to provide adequate nutrition
- To have access to caregivers who provide nutrition services
- To voice complaints and concerns regarding the food, meal service, or any other aspect of nutrition care without fear of reprisal
- To receive consultation concerning nutrition information and instruction relating to needs and interests
- To expect the correct interpretation of orders and delivery of nutrition services to meet needs and preferences
- To refuse any part or all nutrition treatment

A client has the following responsibilities:

- To follow the nutrition care plan recommended by the registered dietitian
- To seek more nutrition information and/or clarification of information given if questions remain, and request follow-up
- To accept the adverse consequences if the nutrition care plan and/or diet as outlined is refused

THE REGISTERED DIETITIAN'S RESPONSIBILITIES RELATED TO CLIENT CARE

The RD must be prepared with nutrition care plans that cover a complete range of nutrition services for clients. Following are examples of services the RD performs to ensure a high level of continuous quality improvement (CQI):

- Provide direction in implementation of the nutrition components of the care plan by communicating with the professional staff and by data collection

- Promote communications (written and verbal) and public relations inter- and intradepartmentally
- Implement procedures for obtaining data collection needed to complete the nutrition assessment and care plan
- Assist in the development of screening tools to assist the dietetics professional and other staff in identifying clients requiring nutrition intervention
- Develop protocols for clients at nutritional risk
- Review, write, or assist in writing menus that meet the current recommended dietary allowances (RDA) and reflect client preferences; at minimum, menus must be reviewed and revised biannually
- Develop therapeutic diets and diets to meet the specialized needs of clients
- Provide recommendations to the physician for appropriate diet orders that include enteral or parenteral feeding
- Assess the client's need for special eating devices with consultation from other caregivers
- Provide direction for the nutrition component of discharge planning including diet instruction and information about community programs
- Provide continuing education programs for nutrition staff
- Conduct the nutrition education for nursing personnel at least annually
- Select and approve a current (5-year) diet manual appropriate to the needs of the facility
- Develop an efficient system for transmitting and implementing diet orders and changes from nursing service to the nutrition service department
- Monitor and evaluate food preparation and service for acceptability, taste, appearance, and portion size; make recommendations as needed
- Participate in budget preparation for the nutrition service department to ensure that staffing, food, and supplies are adequate for client needs
- Evaluate and make recommendations for the adequacy and use of available equipment to provide the required food preparation and service
- Provide guidance on the development of job specifications and descriptions, work schedules, and other management tools necessary for the efficient functioning of the department

- Provide direction or develop guidelines for the nutrition component of the quality improvement program

The RD should not be limited to providing these examples of service, but should also recommend a range of services to meet the nutrition needs of clients throughout the continuum of care.

SUMMARY

Registered dietitians and dietetic technicians are integral components of the health care team. Improving the client's quality of life must be the predominant goal as the client moves across the continuum of care. To meet this objective, RDs/DTRs need to concentrate on the following:

- Appreciating the client's perception of what will improve his or her quality of life
- Using the tools available to measure outcomes
- Understanding regulations that impact quality of life
- Liberalizing diets where appropriate
- Understanding clients' rights and responsibilities relating to medical nutrition therapy (MNT)
- Accepting professional responsibilities

To be effective and achieve high-quality nutrition care for each client, it is imperative that all members of the health care team develop a close, professional working relationship.

Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction, skillful execution, and it represents the wise choice of many alternatives.

— Willa Foster, *Philosopher*

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Relationships Between Nutrition and Disease

INTERVENTIONS IN MALNUTRITION-RELATED CAUSES OF DISABILITIES

A greater percentage of Americans are reaching their 60s, 70s, and 80s, and at every age they are healthier and better nourished than ever before. Great heterogeneity exists in the aging process and consequently in the health and function of older persons. Thus, chronological age only poorly reflects the “biological age” of the individual. The differential effects of genetic, age-driven processes cause the disparities between chronological and biological age. This is largely due to environmental influences that give rise to age-associated diseases and conditions.

The nutrition needs of healthy older persons are similar to those of younger adults but differ in amount, particularly with very advanced age. The insults of disease and frailty may further alter their nutrition needs.

Some older persons have nutrition-related problems or are at risk for malnutrition-related disabilities. They need a nutrition assessment to determine if they are likely to benefit from interventions. Assessment should include anthropometric measurements, biochemical indices, clinical history and examination, dietary intake data, and information on functional status. Measures of physical and mental functional status among older persons can help to better determine the most appropriate interventions for them. Measures for screening, assessment, and interventions tailored to the health problems of older persons are described in detail in several publications.¹⁻³

OBESITY

Obesity is expressed by body mass index (BMI), which is weight in kilograms divided by height in meters squared. A BMI of approximately 27 (27.8 for men and 27.3 for women) is usually considered to represent the threshold of obesity. This corresponds to weight that exceeds 120% of desirable weight for height on the Metropolitan Life Insurance Company tables of 1983.⁴ (See Chapter 14.) Body composition changes as age

increases and fat replaces lean tissue. Water, bone, and lean body mass decline. Therefore, at any given weight older persons tend to be fatter than younger persons.

Reason for Concern

Severe obesity complicates the health care of older adults. Older adults have difficulties in transferring from bed to chair, may have trouble walking, and find toileting hazardous. They are often prone to falls and when falls do occur, hip fracture, broken wrists, and cracked vertebrae are common, especially among those who are already osteoporotic. In clients who are obese or bed-bound, pressure ulcers, hypostatic congestion of the lungs, and leg vein thrombosis are common. Severe obesity increases pain among those who have osteoarthritis and poses risks in surgery. The presence of obesity in older adults who suffer from chronic degenerative diseases may exacerbate them or increase their severity. Common comorbid conditions that increase the health risks of obesity in older adults include the following:

- Diabetes mellitus
- High blood pressure
- Smoking
- Coronary heart disease
- Thromboembolus
- Restrictive lung disease
- Degenerative arthritis
- Gallbladder disease
- Dyslipidemia
- Cancers

Chapter 9 describes medications commonly taken by older adults which may affect appetite.

Interventions

For older persons for whom weight reduction is inappropriate, the goal should be to prevent further gains,

which often makes other problems more severe, and to maximize quality of life. A more proactive approach is reasonable for the older client who has related comorbidities, especially acute symptoms which might be alleviated by weight loss. But it is important that there are specific indications for undertaking such therapy.

A reasonable goal is moderate weight loss, for example, 5% to 10% of body weight or 1 to 2 BMI units (10 to 16 pounds, depending on height) to achieve a healthier weight that helps to control other signs and symptoms of chronic diseases and conditions. This can be accomplished by a gradual but sustained approach involving a moderate balanced deficit diet based on assessed needs. The biological and psychological barriers to loss of greater than 10% body weight are considerable; attempting to normalize weights to “ideal” levels is inappropriate and usually not achievable.

DIABETES MELLITUS

Type 1 diabetes (insulin-dependent) is an autoimmune disease characterized by an absolute deficiency of insulin secretion and a tendency to develop diabetic ketoacidosis. It is rare in older adults. Type 2 diabetes (non-insulin-dependent), the major type of diabetes in older adults, is caused by an insulin secretory defect that gives rise to insulin resistance.

Diagnosing Diabetes

Testing

Fasting plasma glucose (FPG) > 126 mg/dL
(7.0 mmol/L)*

Casual plasma glucose > 200 mg/dL (11.1 mmol/L)
plus symptoms**

2-hour plasma glucose (2hPG) > 200 mg/dL***

* Fasting is defined as no caloric intake for at least 8 hours.

** Casual is any time of day without regard to time since last meal; symptoms are the classic ones of polyuria, polydipsia, and unexplained weight loss.

*** Oral glucose tolerance test (OGTT) should be performed using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water. The OGTT is not recommended for routine clinical use.

Criteria for Testing Asymptomatic, Undiagnosed Individuals

- Type 1 diabetes: Testing outside of clinical trials setting is not recommended.
- Type 2 diabetes: Testing should be considered for all individuals at age 45 and older, repeated every 3 years.

Testing should be considered at a younger age, or carried out more frequently, in individuals who:

- Are obese
- Have a first-degree relative with diabetes
- Are members of a high-risk ethnic population (ie, Blacks, Hispanics, Native Americans, Asians)
- Delivered a baby more than 9 lbs, or were diagnosed with gestational diabetes mellitus (GDM)
- Are hypertensive (> 140/90)
- Have an HDL cholesterol level < 35 mg/dL and/or a triglyceride level > 250 mg/dL
- On previous testing, had impaired glucose tolerance (IGT) or impaired fasting glucose (IFG)

Reason for Concern

Type 2 diabetes is common in the elderly, especially among women and minority group members. The chronic hyperglycemia associated with diabetes gives rise to end organ damage with resulting ocular, kidney, neurological, and cardiovascular disease, impaired quality of life, decreased ability to function independently, and decreased life expectancy.⁵ The signs and symptoms of diabetes in the older adult are often different from those in younger adults, and they may not be recognized. These include involuntary weight loss, fatigue, anorexia, incontinence, disturbed sleep, and/or cognitive disturbances. Management of diabetes can help prevent complications.

Interventions

The goals of treating diabetes in older persons are to minimize acute symptoms stemming from hyperglycemia or hypoglycemia, maintain a balanced diet, and maximize quality of life and functioning while minimizing other complications to the greatest extent possible. Especially in Type 2 diabetes in older persons, weight control, physical activity, and diet are among the keys to control.

Glucose intolerance is common as people grow older because of decreased pancreatic beta cell sensitivity to ingested carbohydrate, increased peripheral resistance to insulin-stimulated glucose disposal with the presence of obesity, decreased physical activity, and various chronic diseases.⁶

Most older persons with diabetes suffer from Type 2 disease, and many of them are likely to be overweight. At least a third of Type 2 diabetes in persons over 70 is associated with obesity. Weight, physical activity levels, and adjustments in medications to avoid diabetogenic drugs are the most easily amenable to change, and they alone may lead to reductions in symptoms and complications without recourse to drug therapy. Moderate

weight losses of 5 to 10 pounds can help glycemic control in such persons, and such efforts should be encouraged.^{7,8} Even if satisfactory control over blood sugar levels cannot be achieved by these measures alone, doses of hypoglycemic agents and other drugs can often be reduced if healthier weights are achieved and sustained, reducing the possibility of side effects and the cost of medications.

When hyperglycemia is uncontrolled, it can give rise to urinary incontinence due to osmotic diuresis, visual disturbances, reversible cognitive impairments, increased susceptibility to infection, and greater risk of stroke. Therefore, lowering blood sugar is important. The most appropriate blood sugar levels that represent the optimum achievable balance of these factors for an individual vary from person to person and are a matter for consultation among the RD, physician, and client. In practice, especially in view of other health problems that may be present, this means that strict definitions of normoglycemia that might be appropriate for younger persons must be interpreted in the context of the older individual's overall health and prognosis. If the individual is asymptomatic, little may be gained in terms of overall health or quality of life from attempts to normalize blood sugar levels.

There is no single diet for diabetes at any age. The ADA's clinical practice guidelines describe steps to take in detail⁹ to achieve the following goals:

- Decreasing body weight
- Decreasing saturated fat intake
- Increasing complex carbohydrates
- Increasing dietary fiber
- Increasing aerobic exercise

For those who are ill or frail, even if vigorous exercise is not possible, some physical activity is worthwhile. Moderation in dietary saturated fat and cholesterol may help to lower risks of hyperlipidemia and, at least over the short term, help to reduce weight. Ideally, goals of < 10% calories from saturated fats and < 300 mg/day cholesterol are suggested. Sodium intakes may also need modification in persons who are hypertensive. Alcohol intakes should be moderate; smoking should be eliminated.

Individuals with Type 1 diabetes are usually not obese. However, some older adults who use insulin are actually Type 2 diabetics who were prescribed insulin earlier in their lives. For such individuals, especially for those who are obese, weight control and moderate changes in diet may be sufficient to control blood sugar levels.

For older adults who have Type 1 diabetes and who are ketosis prone, the use of insulin coupled with an

individually tailored meal plan, physical activity, and monitoring of blood sugar and hemoglobin A1C are necessary to meet treatment goals.

HYPERTENSION

Hypertension is defined as systolic blood pressure of 150 mm Hg or greater, and/or a diastolic blood pressure of 90 mm Hg or greater, or use of antihypertensive medications.¹⁰

Reason for Concern

When hypertension is unrecognized or uncontrolled, damage to target organs occurs, giving rise to cardiovascular disease, congestive heart failure, renal disease, cerebrovascular disease, peripheral vascular disease, and retinal hemorrhaging.¹¹ Hypertension is more prevalent in older adults. Over half of all persons older than 60 years have hypertension. The rates are particularly high among Blacks, the poor, and those living in the southeastern portion of the United States.¹² Yet many health professionals and clients believe that there is little value in treating hypertension in older clients or that only diastolic hypertension warrants attention.

Isolated systolic hypertension, the most common type among those over age 60, also deserves therapy. It is linked to clinical and subclinical evidence of cardiovascular disease, including electrocardiographic evidence of previously unrecognized myocardial infarction, increased left ventricular mass, reduced cardiac diastolic function, and increased carotid artery wall intimal thickness.¹³ Risks of morbidity and mortality from elevated systolic blood pressure are especially common in the older adult.

Obesity, diabetes mellitus, and dyslipidemia increase the risk of hypertension. More than 75% of hypertensives age 70 and older have uncontrolled hypertension, and less than half of those who receive drug therapy have levels lower than 140/90 mm Hg.¹⁴ Evidence shows that treating older adults with systolic, diastolic, and isolated systolic hypertension results in reductions in overall mortality, cardiovascular mortality, and nonfatal cerebrovascular accidents.¹⁵

Finally, postural hypotension, highly variable blood pressures, and pseudohypertension due to arterial rigidity are common in older adults. End organ damage to the kidneys as evidenced by high serum creatinine levels may go unnoticed in older adults. Any serum creatinine above 1.3 mg/dL (115 mmol/L) is elevated, since older adults have reduced muscle mass and smaller contributions of creatine to the amount of creatinine in the blood. Therefore, such a level indicates significantly reduced glomerular filtration.

Interventions

The goals of therapy are to normalize blood pressure; that is, to achieve a blood pressure of 140/90 mm Hg or less with few or no adverse effects (in diabetic clients 135/85 mm Hg or less when possible) and to prevent target organ damage. For those with renal disease, including diabetic nephropathy, blood pressure should be brought to below 130/85 mm Hg if possible to slow the disease progression. It is important to prevent or improve diet-related diseases or risk factors associated with the development of hypertension (ie, obesity or diet-related diseases). Success in management depends on setting realistic treatment goals that involve the client and start with nonpharmacologic therapy.

For those whose average blood pressure is 160/100, who have no target organ damage, and no diabetes, lifestyle modifications often suffice. For persons with blood pressures exceeding 160/100 or who have target organ damage or diabetes, drug therapy may be needed. Immediate treatment is necessary if systolic pressure exceeds 200 or if diastolic is over 120 mm Hg to avoid target organ damage. Every treatment regimen should include lifestyle modifications since these enhance the effectiveness of antihypertensive drugs.

Medications

In addition to diet, the usual procedure is to start with a low-dose diuretic and to increase doses slowly, monitoring for side effects and blood pressure response. Some over-the-counter medications, including laxatives and nonsteroidal anti-inflammatory agents, can worsen blood pressure control. Antihypertensive medications may also have side effects, particularly if given in inappropriate doses; these effects include hyponatremia, hypokalemia, depression, confusion, and possibly postural hypertension.

Nonpharmacological Therapies

Because older adults are already often receiving many medications for various conditions, nonpharmacological therapies are the first approach. Dietary counseling and increased physical activity can be helpful both for this and for altering intakes of nutrients that may be at inappropriate levels in the diet. Lifestyle modifications and medication use can complement and reinforce each other, lowering the amount of medications needed. Alcohol should be used in moderation (1 oz ethanol in males, or 0.5 oz in females).

Dietary Approaches to Stop Hypertention (DASH)

One of the more successful recent interventions to lower blood pressure is the Dietary Approaches to Stop Hypertension (DASH) trial.¹⁶ The dietary pattern that produced good results involved an increase in fruits, vegetables, and low-fat dairy products, and reduced sodium intake levels (< 2.3 g). Reduction of sodium in older adults, especially among Blacks, helped to blunt

the age-associated rise in systolic blood pressure and lower both systolic and diastolic blood pressures in many clients with established hypertension; it may also decrease the need for diuretics.¹⁷ In older adults in extended care facilities, especially among those who are very frail, sodium restriction may produce adverse effects on fluid and electrolyte balance, symptomatic postural hypotension, hyponatremia, and alterations in renal function. Diet palatability is also poor. Blanket low-sodium diet prescriptions for extended care facility residents are outdated; individualization is needed.

Increasing dietary potassium to 3,500 mg (90 mEq/day) may be helpful. Potassium supplementation may have a role in prevention of high blood pressure, but its effects, if present, are less important than weight control and reductions in sodium intake.¹⁸ Therefore, these measures offer more promise.

The evidence that increased intakes of calcium and magnesium decrease blood pressure is not strong, but increasing intakes to 800 mg to 1,200 mg/day for calcium and 280 mg to 350 mg/day for magnesium (eg, levels specified in the Recommended Dietary Allowances (RDA)) is sensible. Very large doses of magnesium supplements are associated with loose stools and diarrhea, and should be avoided. Fiber supplements and omega 3 fatty acid supplements have also been suggested, but at present evidence is insufficient to suggest that they are efficacious.

HYPERLIPIDEMIA

Defining hyperlipidemia in individuals depends on the presence or absence of coronary heart disease, risk factors, and the lipid that is being considered. Risk factors include age, male, smoking, diabetes mellitus, hypertension, cerebrovascular or peripheral vascular disease (PVD), family history of premature (prior to age 55) heart disease, obesity, and low (less than 35 mg/dL) high-density lipoprotein (HDL) cholesterol.

Reason for Concern

Angina pectoris (exertional chest pain) is also very common in older adults and increases with age. The risks associated with elevated blood cholesterol levels are less in the older adult than in young or middle-aged adults. However, since coronary heart disease (CHD) rates are much higher in older adults than in younger clients, high blood cholesterol levels give rise to more coronary events in the older adult. More studies on the effects of lowering blood cholesterol levels on risks in older adults are needed. The most appropriate serum cholesterol levels for persons in the eighth and ninth decades of life are still being debated.

Some older adults have an obsessive, almost morbid fascination with their serum cholesterol levels while others are oblivious to them. Obviously, client wishes

are important in this respect. Physicians also vary in their views about the most appropriate serum cholesterol levels for older adults. Serum cholesterol levels are less predictive of coronary artery disease (CAD) risks among persons older than 65 years than they are in younger persons.

At the same time, very low serum cholesterol levels (below 160mg/dL) as signs of general ill health, the acute phase reaction, or possible malnutrition must also be considered.

Interventions

Older adults are very heterogeneous in their tolerance to prescriptions as well as in their responses to diet and other therapy. Many older adults are not in good health and aggressive treatment for lowering cholesterol levels makes little sense. Such individuals include those whose chronological or physiological ages are very advanced, those with complex and severe comorbidities such as chronic congestive heart failure (CHF), dementia, advanced cerebrovascular disease, or those with active malignancies.

Many otherwise healthy older adults suffer from both high blood cholesterol and high blood pressure. These are best treated with regimens that focus on lowering body weight to more normal levels and decreasing dietary causes of dyslipidemias including saturated fat, total fat, cholesterol, and alcohol. When medications must be employed, blood pressure-lowering drugs should be employed that do not raise serum lipids unless the benefits far exceed the risks (as they may for some thiazides and beta blockers); lipid-lowering drugs should not increase blood pressure.

Control of the multiple risk factors that affect CAD is key to the management of the condition.¹⁹ Modifiable risk factors include smoking, weight control, control of hypertension, diabetes, elevated blood cholesterol, a physically more active lifestyle, and use of estrogen replacement therapy in postmenopausal women. Diet is the first treatment of choice for CAD, and medical nutrition therapy (MNT) may also be useful in managing other risk factors associated with diet such as high blood pressure and high blood sugar.²⁰

Older adults sometimes exhibit very low (below 160 mg/dL) serum cholesterol levels. These are often coupled with low serum albumin, hemoglobin, and hematocrit values. Low serum cholesterol most commonly results from a variety of disease processes, but also occasionally from protein-calorie malnutrition.

OSTEOPOROSIS

Osteoporosis is a disease of the bones in which the bone tissue appears to be relatively normal, but there is very little of it. Loss of bone reduces bone strength and

increases risk of fractures. The onset of osteoporosis depends on certain stages of life or physical conditions, including postmenopausal osteoporosis in women, involutional or senile osteoporosis in old age, and osteoporosis secondary to other diseases in both men and women. Reduced bone density as revealed by dual x-ray absorptiometry (DEXA) is often used to diagnose subclinical osteoporosis. Characteristic fractures of the wrist, spine, and hip (Colles triangle), and scoliosis may also signal its presence. Alterations in posture, loss of height, difficulties in breathing if the chest is distorted, and changes in physical appearance may also be consequences of osteoporosis.

Reason for Concern

Bone mass decreases with advancing age; symptomatic osteoporosis represents the tip of the iceberg. Much undetected asymptomatic disease lies below the surface. Women have less bone to start with and lose it faster after menopause than do men; small women are particularly prone to the condition. Compact cortical bones of the vertebrae, hands, feet, ribs, and hip, and long bones of the appendicular skeleton account for more than three-fourths of the weight of the skeleton. They and the spongier trabecular bone of the axial skeleton, flat bones, and ends of long bones decline. Fractures decrease life expectancy in elderly persons. Attendant disabilities — pressure ulcers, pneumonia, urinary tract infections, and depression — are frequently present. Those problems, in turn, increase dependence and restrict activity.

Interventions

Prevention measures early in life, including proper diet, not smoking, and weight-bearing exercise, can influence bone density of the skeleton and, hence, reduce risk of fracture. Nutrition can alter the risk of osteoporosis through its effects on bone density. Both peak bone mass and the subsequent loss of bone can be influenced by nutritional factors. The peak bone mass achieved depends on genetics, sex, physical activity, and intakes of calcium-rich foods in childhood, adolescence, and young adulthood. Subsequent bone loss is also affected by nutritional factors including calcium intake and adequacy of vitamin D.

The most effective preventive measure to decrease loss of bone at menopause is hormone replacement therapy and consumption of at least the RDA for calcium, phosphorus, and vitamin D coupled with regular weight-bearing exercise.

Nutritional measures help to prevent some forms of osteoporosis associated with extreme age. Senile osteoporosis is sometimes due in part to low intakes of calcium that generate a secondary hyperparathyroidism;

therefore, both men and women should consume RDA levels of calcium and vitamin D. Calcium intakes must cover daily obligatory outputs in the urine, feces, and sweat; otherwise, bone mineral stores of the nutrient will be depleted to maintain serum calcium levels. Declines in calcium absorption associated with aging, along with declines in vitamin D, play a role in osteoporosis. Even if the amount of calcium in the diet remains constant, sufficient amounts of it may not reach body cells if intakes fail to meet RDA levels, currently 1,200 mg per day.

Changes in vitamin D metabolism and use of sunscreen or failure to go outdoors may increase vitamin D requirements. It is important to ensure that intakes of vitamin D are adequate. Skin synthesis of the vitamin from provitamin D declines with age, sunlight exposure is often low especially among the very frail or shut-ins, and the use of sunblock screens out the ultraviolet light that is necessary to convert provitamin D into the biologically active form of the vitamin. Malabsorption of fat and fat-soluble vitamin D in liver disease and certain other diseases and alteration in parathyroid metabolism in kidney disease can further increase demand for the vitamin.

Weight-bearing exercise, especially strength training, walking, and aerobics, may increase bone formation and strengthen muscles so that falls are less likely. Exercise is thus both preventive and curative.

Secondary osteoporosis results from many different diseases including kidney disease, hyperthyroidism, chronic obstructive pulmonary disease, postthyroidectomy, and postgastrectomy status.²¹ Drugs that may increase bone loss that are commonly prescribed to older persons include steroids, anticonvulsants (ie, phenobarbital and dilantin), antacids containing aluminum, and many others. People with these conditions need monitoring since they are at high risk.

Nutrition intervention is imperative to meet the increased energy needs of older adults who have suffered fractures, particularly those of the hip. Adequate nutrition coupled with rehabilitation therapy lessens the risks for pneumonia and the wasting that often ensues with prolonged immobilization.

CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Chronic bronchitis, emphysema, and other respiratory diseases that are characterized by chronic airflow obstruction are commonly referred to as chronic obstructive pulmonary disease (COPD). Usually the signs and symptoms include chronic cough and sputum production daily for 3 months or more during at least 2 consecutive years, dyspnea, and general difficulty in breathing.²² Asthma is not usually included in considerations of COPD.

Reason for Concern

Among older adults, COPD is a major cause of death and functional limitation; it is the fourth leading cause of death in people older than 65. Also, it is a common cause of disability. Without treatment, decline in functional ability, frequent hospitalizations, loss of independence, and a decreased quality of life may occur. Persons with COPD often have poor appetites and some have such severe anorexia that protein-calorie malnutrition ensues with further declines in pulmonary muscle function. Some common medications for COPD, such as theophylline, cause poor appetite and anorexia, whereas others, such as steroids, increase it. As COPD progresses, respiratory inefficiency increases and infections with fever are common, increasing energy needs at the very time food intake and appetite are least, with the result that undernutrition is exacerbated.²³ Because exertion is difficult, energy output from physical activity falls, but the reduced output is inadequate to compensate for other increases in energy needs. Unless nutrition support is provided, older adults in respiratory failure may become even more malnourished when given ventilatory support, since they may increase energy expenditure without increasing their energy intakes.

COPD is frequently accompanied by weight loss, low body weight, and protein-calorie malnutrition. These are associated with a particularly poor prognosis, especially among those who require mechanical ventilation.²⁴⁻²⁷ COPD is a common source of morbidity and mortality in older adults; it predisposes them to infections and poor lung function.

Interventions

Smoking cessation and avoiding other irritants such as dust, fumes, air pollution, and temperature extremes can help salvage damaged lungs and reduce irritation and inflammation of lung tissue. Influenza and pneumonia shots are mandatory to avoid complications and to protect against further deterioration. Bronchodilators and medications such as corticosteroids, antibiotics, and other drugs may assist in reducing symptoms associated with COPD. Pulmonary rehabilitation and oxygen therapy are also helpful to address multiple breathing problems that may be present.²⁸ Comprehensive respiratory care cannot reverse lung damage but can help maintain functional independence. Exercise and reconditioning can help to improve quality of life and reduce hospitalizations.

A good diet and moderate exercise can help prevent the development of protein-calorie malnutrition secondary to COPD. Special nutrition support measures may be necessary. Improved nutritional status may help slow additional declines in lung function due to weakening of respiratory muscle structure and function, and it

may also increase exercise tolerance.²⁹ The major problem is that most of these clients are anorexic and cachectic.³⁰ If they become more undernourished, their immune status, respiration, and general status decrease.

It is worthwhile to check drugs that are being used. Such drugs include some of the antibiotics, bronchodilators and sympathomimetics, cromolyn sodium and nedocromil sodium lipooxygenase inhibitors, and mucolytics. Common problems of COPD clients include early satiety, bloating, anorexia, dyspnea, and fatigue. Anorexia can be minimized by ensuring that drugs are appropriate and that, if possible, drugs decreasing appetite are avoided. Small, frequent meals and readily available prepared foods should be placed where the client is likely to see them and is urged to eat them.

In addition to measures designed to reverse and treat the client who is suffering from protein-calorie malnutrition, other dietary interventions have been suggested to improve lung function and presumably disease state. Most of these are still not well documented and await the results of larger and more definite studies. There are some epidemiological reports that diets high in vitamins C and E^{31,32} and diets high in omega three fatty acids³³ are somewhat protective even in smokers later in life and that diets higher in fat are associated with higher gas exchange and ventilation than those which are not.³⁴

CANCERS

Cancers are a group of diseases whose hallmark is the uncontrolled growth and spread of abnormal cells which, if not controlled or eliminated, can cause death.³⁵

Reason for Concern

More than half of all cancers are diagnosed in persons over 65 years of age, with the most common sites being lung, breast, ovaries, prostate, colon, bladder, stomach, and pancreas.³⁶ Morbidity from cancers is higher in older adults.³⁷ Many of the cancers that are common in older adults are due to environmental factors, and among these smoking and diet have both been implicated in many different cancers.³⁸

Interventions

The dietary causes of cancer are not completely understood but are best avoided at any age. The American Cancer Society's guidelines for reducing cancer risk among those who do not have cancer suggest emphasizing weight control, favoring plant over animal sources of food, decreasing fat intake, eating five to seven fruits and vegetables a day, increasing dietary fiber, maximizing vitamin and mineral intakes from food sources, and consuming none or only moderate amounts of alcoholic beverages.

For those who have cancer, or whose cancer has already been treated, additional dietary measures may be necessary. General goals are to maintain a reasonable weight and to correct or prevent any nutrition and metabolic derangements that are present. Specific goals depend on the type of cancer, location, stage, comorbidities, and ultimate prognosis.

In cancer therapy diet is adjunctive to surgery, chemotherapy, and radiation; it is not curative in itself. During definitive therapy, MNT is highly individualized and should focus on how best to sustain the client through the therapeutic process.

Undernutrition and malnutrition are problems in some clients. Clients with cancers of the gastrointestinal tract are at special risk since these affect consumption or absorption. Endocrine and central nervous system problems can also give rise to undernutrition, anorexia, cachexia, and progressive weight loss. The extent to which various interventions can be implemented varies depending on the cancers, stage, comorbidities, age, and other factors.³⁹ Among the measures that may be helpful are dietary counseling to consume many small meals and commercial or homemade food supplements either at or between meals. Appetite stimulants such as megestrol acetate (Megase®), dronabinol, and prednisone help some clients.⁴⁰

Clients who are unable to maintain oral intakes sufficient to meet their nutrition needs may require various enteral and parenteral products. If the client is very ill or has metastatic disease, difficult ethical questions must be grappled with to determine the advisability of such measures. In general, their use is restricted to clients whose ultimate prognosis points to benefitting from these interventions.

Many vitamin, mineral, and botanical supplements are sold or marketed to older adults to prevent or treat cancer, but with little or no evidence testifying to their effectiveness.⁴⁰

RENAL DISEASE

Renal disease relates to diseases of the kidneys and can be classified into four different physiological categories:

1. Acute renal shutdown: The kidneys stop working entirely or almost entirely (ie, there is an inability of the kidneys to excrete wastes, concentrate urine, and conserve electrolytes).
2. Chronic renal insufficiency: Progressively more nephrons are destroyed until the kidneys cannot perform all the necessary functions, often characterized by less than normal urine excretion.
3. Nephrotic syndrome: The glomeruli become far more permeable than normal and the syndrome is characterized by marked proteinuria, hypoalbuminemia, and edema. (This occurs as a com-

plication of many systemic diseases, diabetes mellitus, amyloidosis, systemic lupus erythematosus, and multiple myeloma.)

4. Specific tubular abnormalities where abnormal reabsorption or lack of reabsorption of certain substances occurs.

Reason for Concern

The kidneys perform three major functions in the body — excretion of excess fluid and wastes, regulation of the body's internal chemistry, and production of two hormones: erythropoietin and the most active metabolite of vitamin D. Adults over 40 years of age can expect a slow, progressive decline in all aspects of renal function. By age 80, studies have shown that renal blood flow decreases by 55%. Consequently, the kidneys are slower to respond to changes in blood chemistry. Fluid balance is also much more difficult to maintain in the older adult.

Dialysis-dependent older adults with renal disease must also deal not only with their feelings about being dependent on artificial means of elimination, but also with changes in their quality of life. Renal disease is a chronic, progressive illness not to be taken lightly. Much time will need to be devoted to dialysis and following dietary limitations and medication regimes. Taste changes, thirst, and anorexia may also occur in the renal dialysis client. As renal disease progresses, MNT for the older adult becomes more complicated and malnutrition more difficult to correct. Primary nutrition risks for the older adult include calorie-protein malnutrition, hypertension, renal osteodystrophy, and anemia.

Interventions

Nutrition guidelines for the various stages of renal disease have been approved by the Renal Practice Group of the ADA and by the Council of Renal Nutritionists of the National Kidney Foundation. The protein, sodium, potassium, phosphorus, and fluid-controlled diet is designed to attempt to provide adequate amounts of essential nutrients and sufficient calories to maintain optimal nutritional status in those clients with impaired renal function.⁴¹

Many nutrients need to be restricted. Such modifications include the following:

- Protein intake needs to be controlled to avoid excessive amounts of nitrogenous waste products in the blood and to prevent negative nitrogen balance. The amount of protein allowed in the diet is based on renal function and type of dialysis.
- Sodium content of the diet is controlled to help maintain normal hydration status, to avoid fluid

retention and hypertension, and to help prevent congestive heart failure.

- Potassium content of the diet is controlled to prevent hyperkalemia as well as hypokalemia in some instances.
- Phosphorus needs to be controlled and calcium may need to be supplemented to avoid bone disease. As phosphate concentration rises, the serum calcium level decreases. Phosphorus intake is reduced by limiting dairy products and foods high in phosphorus. Serum phosphorus is best controlled with the use of phosphate binders taken with meals.
- Urine output is often decreased in renal failure. Fluid allowance is based on 24-hour urine output plus 500 mL to 1,000 mL per day.
- Calories should be sufficient to achieve and maintain optimal nutritional status and prevent catabolism.
- Vitamin requirements vary depending on dietary restriction and type of dialysis. With the exception of vitamin D, the requirements for fat-soluble vitamins are usually met. Avoid fat-soluble vitamin supplements, especially vitamin A. Intake of water-soluble vitamins is inadequate due to restriction of foods rich in water-soluble vitamins, vitamin losses in dialysis, and altered vitamin metabolism, and through cooking methods designed to extract potassium. A supplement of water-soluble vitamins should be prescribed. Supplementation of vitamin D may be needed.
- The common minerals that need to be monitored are calcium, iron, and magnesium.

For further information and discussion refer to Chapter 10.

HEPATIC DISEASE

Hepatic disease relates to diseases of the liver.

Reason for Concern

Aging impacts both the anatomy and function of the liver. The relative weight of the human liver drops from about 4% of body weight in a newborn infant to 2% of body weight in the older adult. With this change, functional changes including decreased rates of protein and enzyme synthesis may occur. Livers of individuals between 69 and 91 years exhibit only minor histologic changes that are interpreted as being signs of aging, but may not be specific for aging. A prime example is non-A, non-B hepatitis, which is the most common cause of advanced liver disease in the older adult.⁴²

With the reduction in liver size with age, hepatic volumes also decrease. These two changes may also account for the observed reduced drug elimination in this population. Aging does not produce alteration in so-called liver function tests; thus, abnormal values for these tests reflect disease rather than effects of aging.⁴³

Interventions

The older adult often suffers from diseases of the liver and biliary tract. Alcoholic liver disease (ALD) is the ninth leading cause of death in the United States, which means about 10% of the population dies from ALD. A significant number of these deaths are in older adults. ALD progresses in three stages: hepatic stenosis (fatty liver), alcoholic hepatitis, and cirrhosis. Hepatic stenosis is reversible with abstinence from alcohol.

Since there is a high incidence of malnutrition in ALD, nutrition plays a vital role. MNT provided to the ALD client should provide a high energy intake with high carbohydrate intake to prevent catabolism of body tissue. Protein should be in sufficient amounts to promote rehabilitation, along with vitamins and minerals to meet or exceed the individual's needs.⁴⁴

Cirrhosis, the final stage of ALD, can also be caused by right-sided congestive heart failure, primary sclerosing cholangitis, autoimmune hepatitis, biliary atresia, and long-term chemical or drug exposure. This can lead to hepatic failure as a result of liver function being diminished to 25% or less. Postal systemic encephalopathy (PSE), formerly known as hepatic encephalopathy, is a complication of liver failure manifested by a variety of neuromuscular and personality behavior alterations.

Moderate to severe malnutrition is common in clients with advanced liver disease. Other coexisting factors contributing to this malnutrition besides inadequate oral intake are anorexia, dysgeusia, early satiety, nausea, vomiting, and drugs used to treat the disease. Individuals with ALD have higher nutritional requirements — in general, 23 kcal to 35 kcal/kg with most of the nonprotein calories being carbohydrate because fat metabolism may be impaired. Protein is the most controversial nutrient in liver failure and also the most complex. In uncomplicated hepatitis or cirrhosis, the protein requirement is 0.8 g to 1.0 g/kg. To achieve positive nitrogen balance, at least 1.2 g/kg is needed. Unnecessary protein restriction (< 50 g/day) may only worsen body protein losses and should be avoided. Vitamin and mineral supplementation is needed.

In liver resection and transplantation, nutrition needs are increased to promote liver cell regeneration. Enteral nutrition is vital in liver resection because of the role of partial hepatotrophic factors necessary to promote cell growth. In transplantation, dietary modification is based on the specific side effects of drug therapy as well as the increased nutrition needs.

IMMUNE SYSTEM DISEASE

In immuno dysfunction, the thymus-dependent cell-mediated immunity is consistently more vulnerable to chronic nutrition imbalances than antibody-dependent humoral immunity. Coincidentally, those T-cell functions most sensitive to given nutrition perturbation are precisely those that have been established to decline in the older adult. Moreover, the progressive T-cell dysfunction with advanced age has been implicated in the etiology of many of the chronic degenerative diseases of the older adult (ie, arthritis, cancer, vascular injury, and autoimmune complex diseases) as well as a pronounced increased susceptibility to infectious disease.^{42,43} Immunosuppression during transplants is also essential to avoid organ rejection. Finally, there is acquired immunodeficiency syndrome (AIDS) caused by human immunodeficiency virus (HIV) infection.

Reason for Concern

Immune function declines with age; for example, T cells, perhaps the most vulnerable, show a decline in function. These changes are referred to as immunosenescence.⁴² Current thinking is that while some changes may be inevitable, many due to disease are preventable or treatable. Many autoimmune diseases and therapies that alter immune response have nutritional implications. Malnutrition may also worsen disease-caused weakening of the immune system, thus increasing susceptibility to infection.

The widespread hypothesis that compromised immune status in older adults results from malnutrition often brings clients to ask what they can eat to improve immune function. Therefore, it is important for health professionals to be well informed about the links between nutrition, immune function, and aging.

Interventions

The possible attenuating role of nutrition intervention during progressive immunosenescence is a provocative, although still relatively unexplored, area.⁴²

Severe protein-energy malnutrition does alter the proportion of T-cell types, depresses T-cell function, and impairs both delayed hypersensitivity and thymic factor activity. These changes may increase susceptibility to infectious diseases. Some immune function defects are reversed by nutrition support among those who are severely malnourished and suffer from protein-calorie malnutrition (PCM) due to inadequate dietary intake. Immunocompetence is not restored by nutrition support in those who are severely malnourished with wasting diseases such as cancer or HIV infection.

Specific nutrient deficiencies, such as zinc deficiency, are associated with impaired immune function.⁴⁵

However, zinc supplementation has variable and not always positive effects in improving antibody responses.

Some studies report that dietary supplements of vitamins, minerals, or other nutrients improve antibody responses to viral vaccines among older adults. It is unclear if these effects are due to supplements or to simultaneous treatment of underlying illnesses.⁴⁵

Some older adults are immunosuppressed as a side effect of treatment for organ or marrow transplants and immunosuppressive chemotherapy given for certain cancers, severe arthritis, early primary biliary cirrhosis, and other diseases. After a course of immunosuppressive therapy, the client may be debilitated and in need of nutrition support to restore lost weight and lean body mass.

Diseases such as HIV infection cause immunosuppression. When HIV infection is present, the goals of MNT are to preserve lean body mass and to prevent dietary deficiencies including PCM and vitamin and mineral deficiencies. Special dietary modifications may be needed to provide symptomatic relief for the many opportunistic infections that arise.

Other diseases common among older adults, such as severe liver disease, alter some aspects of immune function, although they do not suppress it. The diet therapy of liver disease is discussed earlier in this chapter.

Rheumatoid arthritis and some other autoimmune diseases of older adults have nutritional implications. Nutrition neither causes nor cures rheumatoid arthritis or osteoarthritis (which is not an autoimmune disease). Arthritis victims need to avoid the questionable dietary remedies that abound for treating the condition; some are dangerous and there is little evidence to support their claims. Elderly adults with osteoarthritis of weight-bearing joints sometimes experience symptomatic relief from weight reduction if they are obese. It is easier to walk and perform daily activities when they carry less weight.⁴⁵

Sjogren's syndrome is an autoimmune disease characterized by decreased saliva production, dry mouth, and, consequently, difficulties in eating and increased dental caries.⁴⁵ It is treated by alterations in dietary consistency, consumption of noncarcinogenic foods, and scrupulous oral hygiene.

DEMENTIA

Dementia includes disorders characterized by development of multiple cognitive deficits including memory impairment and any one of the following:

- Aphasia
- Apraxia
- Agnosia

- Disturbance in ability to process new and complex information

The causes of the deficits are many and include multiple etiologies of both disease, substance abuse, or other etiologies.

Reason for Concern

Dementias often go unrecognized in their early stages because cognitive status is not routinely assessed. Many affected people may be present in the community placing a burden on their families. In older adults two types of dementia stand out — senile dementia of the Alzheimer's type (SDAT) and vascular dementia which includes multi-infarct dementia (MID) among others. Other types of dementia include those associated with Parkinson's disease, Huntington's disease, substance abuse, and many other conditions.⁴⁶ People with concurrent disease that affects mentation, such as stroke, and those with sensory deficits are particularly at risk. For example, those with Type 2 diabetes are more likely to be at risk for dementia, especially those associated with vascular disease.^{47,48} The signs of Alzheimer's disease include memory loss affecting job skills, difficulty performing familiar tasks, problems with language, time and space disorientation, poor judgment, problems with abstract thinking, misplacing things, and changes in mood/behavior, personality, and initiative. The prevalence of dementia rises steeply with age and reaches rates of almost 50% in persons over age 85. Since the segment of the population over 85 is among the most rapidly growing group of elderly, management of dementia is becoming a major problem.

Interventions

Interventions to reverse excessively low body weight are important in patients with dementias, although it is still not clear why such patients lose weight. Whether the weight loss often associated with dementia is the cause⁴⁹ or an effect of the disease⁵⁰ is less important than minimizing declines in weight among those with Alzheimer's disease. There are many practical interventions that help to improve the behavioral problems of individuals suffering from dementia; these are detailed in Chapter 14.^{51,52} Another cause for weight loss is the possibly high energy needs of SDAT clients due to high physical activity, unrecognized infections that raise energy needs, or other causes.⁵³ A final cause of low intakes is that some of the medications used in dementia cause anorexia or poor appetite. These include several of the common antipsychotic, antianxiety medications, and donepezil (Aricept®). Dosing may require adjustment, or another medication may be available that has fewer side effects.

Some older adults with dementia have rather high energy needs because their physical activity is high, owing to pacing. Higher energy needs can also be due to unrecognized infections such as pneumonia, upper respiratory infections, and urinary tract infections that increase energy needs. Therefore, it is important to look for their presence and to treat them.

Alterations in body composition may also be present in Alzheimer's disease with patients exhibiting a low body-mass index (BMI) coupled with a low percentage of body fat and trunkal fat, high lean body mass, and higher total body water than usual.

For clients who are unable to consume foods orally and for whom life-sustaining measures are indicated, enteral or parenteral feeding may be instituted. If life-sustaining measures are not indicated, medical direction is essential in confronting the ethical issues involved, and comfort measures should be instituted.

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Risk Factors Associated with Poor Nutritional Status

Aging is a complex process defined by the interplay of numerous and diverse life events experienced over time. Because genetic makeup and human response are unique to each person, the aging process is characterized by heterogeneity.¹ Nutrition needs and concerns in older adults tend to be multifactorial in nature and are not always easy to identify or to meet.² While it is apparent that physiologic systems wear out at different rates, it remains unclear as to how much of this variability is generic to the aging process, and how much is due to failure to change attitudes and behaviors that negatively impact health.³⁻⁷

Risk factors associated with poor nutritional status in older adults are discussed in this chapter. Definitions are provided, reasons for concern are identified, and general recommendations regarding appropriate intervention are described.

Parts of this chapter deal with a variety of economic and social factors not always recognized as relevant to the maintenance of optimal nutritional health. While these factors may not always be perceived as applicable to nutritional status, particularly that of clients in care settings, they are extremely relevant to admission and discharge planning. Clients frequently leave the extended care environment for varying periods of time to be admitted to acute care facilities, rehabilitation centers, or to return home. The economic and social factors described are relevant in these situations.

Caregivers must remember that it is important to view each older adult as a unique person with highly specific needs. Individualized nutrition care plans that are designed to accommodate specific identified needs are the hallmark of quality nutrition care.

NUTRITIONAL RISK FACTORS

A nutritional risk factor is a characteristic or occurrence that increases the likelihood that a person will have or already has a nutrition problem(s).² Obviously, the greater the number of these occurrences or characteristics that a client experiences and the longer that they

persist, the greater the likelihood that poor nutritional status will result.

A variety of medical and psychosocial stressors have the potential to negatively impact nutritional status.² Mowe and Bohmer⁸ cite reduced appetite and taste, dental problems, and difficulties in shopping and cooking as factors prevalent in an older population during the last month before hospital admission when compared to a reference group of older adults living at home. A number of authors in the United States,^{2, 9, 10} as well as those in other countries,^{2, 11-13} have identified factors similar to those described in this chapter which increase the risk of poor nutritional status in the older adult. Recognition of their presence often serves as an "early warning sign" of impending malnutrition.

Many contributors to poor nutritional status can be anticipated and prevented or delayed through guidance and intervention to reduce risk. Thus, it is important to know the risk factors for poor nutritional status in older persons and to intervene in a timely and appropriate fashion.

INAPPROPRIATE FOOD INTAKE

Inappropriate food intake is the inadequate or excessive consumption of food and fluid (nutrients).

Reason for Concern

To maintain optimal nutritional status, a person must have access to and the ability to consume an appropriate food and fluid intake. People who are unable or unwilling to eat die unless fed via some other modality. A recent study by Franzoni, et al¹⁴ with 72 relatively healthy older adults showed that low intake levels of calories, protein, carbohydrate, and fat were strong predictors of mortality, even after adjustment for the cofounders of age, gender, body mass index, functional status, emotional status, energy, and nutritional status.

Older adults eat smaller meals and eat more slowly than do younger individuals.¹⁵ Although there is little clinical evidence that significant malnutrition occurs as a result of the aging process per se, decreased gastroin-

testinal reserve¹⁶ makes older individuals highly sensitive to minor insults, and decompensation can occur rapidly. Rolls¹⁷ demonstrated that sensory-specific satiety changes with age and was absent in some individuals older than 65 years. This finding was proposed as a partial explanation for the habitual consumption of monotonous diets by older adults. Clarkston, et al¹⁸ in a study of the relationship between the effects of aging on appetite and gastrointestinal transit concluded that aging is associated with a diminished desire to eat, reduced hunger, slowing of solid and liquid gastric emptying, and autonomic nerve dysfunction.

In the United States, the problem of overconsumption of food and fluid is of equal, if not greater, concern. In a study of 120 free-living older women,¹⁹ approximately 50% had olfactory dysfunction which manifested itself as lower interest in food-related activities, lower preference for foods with a sour/bitter taste and for pungent foods (fruits/vegetables), higher intake of sweets, reduced intake of low-fat milk products, and a nutrient intake profile indicative of increased risk of cardiovascular disease. At the midpoint review of the Healthy People 2000 report,²⁰ most of the nutrition objectives relate to prevention/delay of the progression of the chronic diet-related diseases through modification of food intake.

Interventions

The frequency with which food is eaten, the quantity and quality of the food consumed, and other factors that contribute to excessive or inadequate food or fluid intake must be routinely and systematically assessed. Questions regarding programs that provide money for food, food itself, meals for the bedridden or infirm, or broader levels of economic, medical, or social support should be included. Direct observation of food intake, dietary recall or records of food intake, and careful questioning of both the older individual and caregivers or family members are additional ways in which information can be gathered. Mistaken health beliefs, distorted body image, and excessively self-imposed dietary modifications should also be questioned. (See Chapters 8-14 for additional information regarding nutrition assessment.)

Documentation of the data and its availability to appropriate members of the health care team are

mandatory. Longitudinal monitoring and appropriate adjustment of care plans are integral to this process. Once specific problem areas are identified, appropriate nutrition, medical, social, and/or economic interventions can be implemented.

POVERTY

Insufficient economic and other resources to meet basic needs define poverty. The cutoff point for eligibility for a variety of federally funded service programs for the indigent is 125% of the federally designated "poverty level" in dollars.

Reason for Concern

In 1995 the average poverty threshold for persons 65 years of age and older was \$7,309.²¹ As of March 1996, 8.6% of people 65 to 74 years and 13% of people 75 years and older fell into this category. This represents over 3.3 million Americans. The highest percent of these individuals are minorities, those living alone, and those living in the South. The median duration of poverty in those 65 years and older is 7.2 months, with 13.3% of older persons living at this level for greater than 2 months and 4.9% subsisting at this level for 24 months or more.²² Statistics related to poverty level and gender are no longer being kept.

Low income older adults often have limited access to food and limited food choices, particularly when utility and phone bills, medication, and similar expenses compete with already scant funds. Surveys of food consumption patterns show that low income adults have consistently lower intakes of most nutrients.¹⁰ The degree and significance of these findings depend on the specific nutrient assessed.

Interventions

Questions regarding level and sources of income and adequacy of present income to meet basic needs must be asked whenever nutritional status is assessed. Questions regarding the specific amount of money or other resources available *specifically for food* may also yield significant information about the ability of older individuals to obtain the food they need to maintain health. Reliance on any type of economic assistance program to meet basic needs (eg, food, housing, medical) should trigger an awareness that funds are limited and that risk of poor nutrition may be increased.

When a person's income is insufficient to meet basic needs, economic assistance can be sought on either an emergency or continuing basis. However, food assistance (eg, food stamps, home-delivered meals, congregate meals) and other similar services differ in availability and acceptability to the individual client. Rarely are these resources utilized by a significant percent of those eligible to receive them. Awareness of the full

Interventions

Interventions include, but are not limited to:

- Allowing adequate time for the consumption of meals and snacks
- Alterations in the flavor, texture, and temperature of foods served
- Dietary counseling
- Nutrition education
- Participation in community nutrition programs
- Specialized feeding regimens

range of options available and patterns of use within the community increase the likelihood that identified needs will be met.

SOCIAL ISOLATION

The Institute of Medicine¹ defines social isolation as “the absence of social interactions, contacts, and relationships with family and friends, with neighbors on an individual level and with ‘society at large’ on a broader level.” Social isolation is usually measured by evaluating the type and strength of a person’s social support network and how he or she uses it.

Reason for Concern

It is well documented that social interaction has a positive impact on health, quality of life, and food intake.²³⁻²⁷ In a study²⁵ of approximately 2,500 people 65 to 102 years of age who lived in a rural area, a decrease to a low level of social interaction was associated with an increased mortality risk in both men and women. Social integration seems to have a particularly positive impact on postmyocardial infarction prognosis.^{26,27}

As age increases, loss of family and friends is inevitable. Declines in independence, self-esteem, and income are often experienced. Feelings of apathy, denial, depression, grief, loneliness, and/or suicidal rumination may be overwhelming. Each of these has the potential to negatively impact food intake and nutritional status.

Interventions

Attempts must be made to identify socially isolated people and to provide or increase their opportunity for social interaction. It is particularly important for dietetics professionals to assess individual utilization of senior citizen centers, congregate feeding sites, meals-on-wheels programs, and similar community resources that supply food, promote social contact, and provide an opportunity to use and maintain interpersonal skills. Participation in such programs should be encouraged, when appropriate.

In institutional settings, congregate dining should be encouraged even as self-feeding skills decline. Alternative table shapes, positioning those who require feeding assistance so that food intake in a group setting is facilitated, the use of music appropriate to the generation being fed, and so on are minor modifications that can have a significant impact on food intake and nutritional status.²⁸ (See Chapter 15.)

PHYSICAL INACTIVITY OR IMPAIRED FUNCTIONAL STATUS

Physical inactivity or impaired functional status is defined as an inadequate level of aerobic fitness or an

inability to perform those activities necessary for routine self-care.

Reason for Concern

More than 60% of adults living in the United States do not achieve the recommended amount of regular physical activity, while 25% are not active at all. Physical inactivity is more prevalent among women, minorities, older adults, and the poor.²⁹ For the older adult, regularly performed aerobic exercise improves functional capacity and reduces the risk of developing Type 2 diabetes.³⁰ Regular exercise appears to be especially effective in cutting the risk of premature death and death from heart disease, reducing the risk of developing hypertension and colon cancer, and lowering blood pressure, blood sugar, and body weight.²⁹ Moreover, in the older adult regular exercise improves moods, reduces the risk of falls and fractures,²⁹ and preserves or enhances skeletal muscle mass and functional status.³¹ These effects are seen in both extended care and community settings.

According to Wollstadt et al.,³² the older adults most likely to be at risk for poor functional status were those in extended care facilities or those with frequent visits to the physician’s office for treatment. Older adults who had not visited the physician’s office in 6 months had the highest fitness level.

Maintaining or improving the capacity to function, prevention or delay in the onset of the chronic diet-related diseases, and the potential to delay institutionalization may be the best reasons to encourage regular physical activity in older adults. The prevalence of functional limitations in older adults living in the community increases with advancing age and is well described in other references.^{1,2,29,33} Difficulty in performing activities of daily living (ADL) or the instrumental activities of daily living (IADL) is often cited as a factor in the decision to place the older adult in alternate care settings.

Interventions

A general indication of functional status is often useful in determining increased nutritional risk² and the risk of an adverse hospital outcome.³⁴ Tools used to accomplish this task are the ADL and IADL assessment protocols.^{35,36} Of course, the assessment of eating behaviors and factors that contribute to eating dependency are also important.³⁷ Difficulties related to eating, food preparation, or food procurement must be identified and documented early, and appropriate community, social services, or therapeutic modalities implemented.

SELECTED ACUTE AND/OR CHRONIC DISEASES OR CONDITIONS

The presence of any acute or chronic disease or condition, depending on the prior health and nutritional status

of the person afflicted, and the nature and extent of the disease or conditions' effects may negatively impact nutritional status. In addition, hospitalization, trauma, surgery, and infection may also have a negative impact on nutritional health.^{1,2,28,38} Complaints, clinical manifestations or symptoms of diet-related diseases and conditions, or decline in the ability to eat, prepare, or purchase food are each warning signs of increased nutritional risk.

The Nutrition Screening Initiative (NSI) has recently published a book that addresses the role of nutrition in 10 disease states commonly seen in older persons.²⁸ (See Chapter 6 for additional information.) Prevention of aspiration and dehydration, assessment, and treatment are also addressed. In addition, the American Medical Directors Association (AMDA), starting with a prior Agency for Health Care Policy and Research (AHCPR) document, has published detailed clinical practice guidelines regarding the prevention and treatment of pressure ulcers.³⁸ (See Chapter 13.) The subject of nutrition related to this condition is reasonably well addressed in this publication. Alcohol abuse, constipation, depression, oral health problems, sensory impairment, and use of chronic or inappropriate medications are also of particular concern.

ALCOHOL ABUSE

According to the *Diagnostic and Statistical Manual of Mental Disorders*,³⁹ the essential feature of alcohol abuse is a pattern of potentially reversible, maladaptive behavioral changes leading to clinically significant impairment or distress due to the ingestion of alcohol. The symptoms are not due to a general medical condition and are not better accounted for by another mental disorder. The three main patterns of alcohol abuse or dependence are regular or daily intake of large amounts of alcohol, regular heavy drinking limited to weekends, and long periods of sobriety interspersed with binges of daily drinking lasting weeks or months. Although alcohol dependence is frequently associated with depression, depression appears to be the result of, rather than the cause of, the drinking.

Ten Disease States Commonly Seen in Older Adults

- Cancer
- Chronic obstructive pulmonary disease
- Congestive heart failure
- Coronary heart disease
- Dementia
- Diabetes mellitus
- Failure to thrive
- Hypertension
- Osteoporosis
- Pneumonia

Reason for Concern

Alcohol-related problems manifest themselves in a variety of physical and psychosocial forms including, but not limited to, the following:

- Alcoholic liver disease
- Alcoholic dementia
- Peripheral neuropathy
- Depression
- Insomnia
- Loss of libido
- Late-onset seizure disorder
- Confusion
- Poor nutrition
- Involuntary weight loss
- Macrocytosis
- Incontinence
- Diarrhea
- Heart failure
- Hypertension
- Myopathy
- Falls
- Fractures
- Inadequate self-care
- Adverse drug reactions

It is estimated that in older adults seeking medical care for any reason, approximately 10% to 15% have an alcohol-related problem. Approximately one-third of alcoholics age 65 years and older are late onset drinkers. Their cost to the health care system is more than \$230 million annually.⁴⁰

Interventions

It is important to evaluate how often alcohol is consumed and whether this level of consumption represents a health hazard. Older adults may show a different pattern of alcohol abuse than do younger people. Differences in body composition and changes in metabolism that occur as part of the aging process increase the risk for

medical and psychological problems at all levels of consumption.⁴⁰

The screening process used to assess alcohol intake and its significance involves the use of easily administered, standardized questionnaires that are fairly sensitive when used appropriately.^{2,3,40}

"CAGE" Questionnaire

- C:** Have you ever felt you ought to **Cut Down** on drinking?
- A:** Have people **Annoyed** you by criticizing your drinking?
- G:** Have you ever felt bad or **Guilty** about your drinking?
- E:** Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover (**Eye-opener**)?

Once a problem has been identified, the RD should work with other members of the health care team who are involved in the treatment process to assess the vitamin, mineral, and caloric status of the older person who is drinking, recommending provision of critical nutrients to prevent the nutrition-related sequella of alcohol withdrawal and to correct the chronic nutrient deficits identified.

CONSTIPATION

Constipation is the infrequent or difficult evacuation of feces. People often subjectively define constipation as the passage of fewer than “normal” bowel movements, failure to have a daily bowel movement, and/or increased difficulty in defecation. Because the range of normal for this bodily function varies widely, a more precise definition is lacking.⁴¹

Reason for Concern

Constipation is not an inevitable part of the aging process, but physiologic alterations that sometimes accompany aging, such as decreased intestinal motility, increased transit time, and a decreased urge to defecate, may contribute to its prevalence.

About 4.5 million people in the United States, many of whom are 65 years of age and older, complain of chronic constipation. Constipation is the most common gastrointestinal (GI) complaint in the U.S., resulting in about 2 million physician visits annually. Thus, there is indirect evidence, at least, that the perception of real or imagined constipation in our population, particularly the ambulatory older adult population, is high. Approximately \$725 million is spent on laxatives by Americans each year.⁴¹ Recently, the FDA has banned all over-the-counter laxatives that contain phenolphthalein because its use may increase cancer risk.

In extended care settings, factors associated with regular laxative use (> 30 doses per month) were immobility, Parkinson's disease, diabetes mellitus, and use of iron supplements, calcium channel blockers, and antidepressants with strong to moderate anticholinergic properties.⁴² Changes in bowel habits often occur with diverticular disease and colon cancer. Fecal impaction, overflow incontinence, obstruction, and terminal reservoir syndrome are potential outcomes of chronic, extreme constipation.

Interventions

Dietary modifications can be effective in the prevention or treatment of primary constipation. Increased dietary fiber and fluid intakes are recommended, as is regular physical activity. Medication protocols should be reviewed and less constipating alternatives recommended when appropriate. Systemic disease should, of course, be treated.

Clients should be encouraged to consume diets containing 20 g to 35 g of fiber daily.⁴¹ Coarse wheat bran provides the greatest fecal bulking capacity, and bulking agents such as psyllium, methylcellulose, carboxymethylcellulose, and polycarbophil produce laxative effects due to their water-holding properties and the mechanical distention of the GI tract. These bulking agents are sometimes more acceptable to clients than is coarse wheat bran. An adequate fluid intake (minimum 1 mL/kcal ingested, 30 mL/kg/day or 1,500 mL to 2,000 mL) is also essential to the maintenance of healthy bowel function.

The gradual introduction of high-fiber diets and fiber supplements over several weeks and in slowly increasing amounts helps to minimize flatulence, distention, and the abdominal discomfort that sometimes accompany the introduction of a high-fiber regimen. Consuming a variety of the food sources that supply dietary fiber is the preferred method for increasing the fiber content of the diet. Supplements can be used to augment the diet if the food sources fail to produce the desired effect when given an adequate trial.

People who have neuromuscular damage, adhesions due to prior surgery, chronic disability, or chronic laxative abuse do not always respond to fiber therapy. However, these circumstances do not automatically preclude a trial of fiber therapy, bowel training, and other rehabilitative efforts.

DEPRESSION

The essential features of depression include either a depressed mood or loss of interest/pleasure in all or almost all activities for a period of 2 weeks or longer, accompanied by four or more of the following daily or almost every day:

- Significant involuntary weight change
- Insomnia or hypersomnia
- Psychomotor agitation or retardation
- Fatigue or lack of energy
- Feelings of worthlessness or excessive guilt
- Decreased ability to think or concentrate
- Recurrent thoughts of death or suicide³⁹

The altered mood should represent a change from the previous level of functioning. If it persists for longer than 2 months, it may signal a major depressive disorder. Associated features of depression include tearfulness, anxiety, irritability, brooding or excessive rumination, and excessive concern with physical health.

Reason for Concern

Depressive symptoms occur in approximately 15% of adults over 65 years of age. The prevalence of major

depression among older adults living in the community is estimated at less than 3%. Rates of major or minor depression among older adults range from 5% in primary care settings to 15% to 25% in extended care facilities. Rates of new cases of depression in extended care facilities are startling — 13% of clients develop a new episode of major depression during the course of one year; another 18% develop new depressive symptoms.⁴³ It is estimated that only about 10% of older adults who need psychiatric treatment receive this care.

Major risk factors for depression in older adults include:

- Female gender
- Unmarried
- Widowed
- Stressful life events
- Lack of social support
- Co-occurrences of physical conditions (ie, stroke, cancer, dementia)

Up to 40% of people continue to experience depression over time.^{39,43} Risk for suicide and rates of completed suicide are higher in older people. Older white males are at highest risk.

Depression or depressive symptoms significantly impact quality of life. Level of function, productivity, and perceived physical and emotional health are also impaired. Nutritional status is in jeopardy since symptoms of depression relate to changes in appetite and weight and lack of interest in food.³⁹ In fact, depression has been shown to be a leading cause of unexplained weight loss in the older adult.⁴⁴

Many of the psychotropic drugs commonly used to treat depression, such as antidepressants, antipsychotics, antianxiety agents, and anticholinergic agents, have significant side effect profiles and may negatively impact the ability to eat and, in turn, nutritional status. Over-sedation, cognitive impairment, delirium, increased or decreased appetite, dry mouth, nausea, anorexia, and constipation, all common side effects of many of these drugs,^{39,44} may contribute to increased nutritional risk.

Interventions

Numerous screening tools are available to assess emotional status.² Although the RD/DTR does not routinely administer these instruments, he or she should be cognizant of their content, use, and implications. Changes in mood, attitude, or level of performance should alert all professionals to the potential for depression. Discussion of this possibility with other members of the health care team is appropriate, as is regular inquiry into the client's emotional status.

A routine review of medications prescribed to treat depression is indicated in light of their significant potential to negatively impact nutritional status. Drug-free periods or reductions in dosages should be recommended, particularly if these agents are shown to be a significant source of nutrition impairment. The RD/DTR should also be familiar with the risk/benefit of the numerous drugs (growth hormone, megestrol, cyproheptadine, tetrahydrocannabinol, anabolic steroids, and prokinetic agents) used in the treatment of the anorexia of aging with limited success.⁴⁴

ORAL HEALTH PROBLEMS

Tooth loss, dental caries, lack of or poorly fitting dentures, periodontal disease, pathologies of the oral tissues, dry mouth, and orofacial pain are considered oral health problems.^{2,45}

Reason for Concern

Problems with the oral cavity often impair one's ability to eat. Local as well as systemic morbidity may result, and decreased life satisfaction is common. Although recent data from national surveys suggest that older adults retain their teeth for a longer period of time, of those currently over age 65, 40% are edentulous and only 2% have all 28 teeth.⁴⁵ Edentulism is more common among minorities, those with less education, and those with lower incomes.

Root caries, gingivitis, periodontal pockets, and loss of periodontal attachment are more common among older individuals.⁴⁵ Risk factors for the development of periodontal disease include the following:

- Male gender
- Advanced age
- Osteoporosis
- Diabetes mellitus
- Tobacco use
- Plaque and calculus accumulation
- Infrequent dental appointments⁴⁶

Risk factors for the development of oral cancer include advanced age, tobacco and/or alcohol use, chronic sun exposure, and a previous diagnosis of cancer.⁴⁷ The majority of deaths from oral cancer occur in individuals over 65 years of age.

A major cause of unexplained weight loss in older persons is poor oral health. As the number of dental problems increases, so does the rate of weight loss. Systemic diseases and their treatments frequently affect salivary, oral motor, and oral sensory function.⁴⁸ Diminished taste or alterations in taste perception are often experienced by people with complete dentures.

Oral pathogens, due to bacteremia or aspiration of oral contents, can be responsible for serious systemic infection.

Interventions

Periodic examination of the oral cavity with documentation of specific findings is mandatory. Appropriate intervention has the potential to significantly improve food intake, nutritional status, and quality of life.

SENSORY IMPAIRMENT

Sensory impairment is the abnormal, diminished, delayed, or absence of perception or response to stimuli.

Reason for Concern

Functional declines in sensory organs occur with advancing age and are associated with increased risk of poor nutritional status. Declines in hearing and vision are among the 10 most common conditions reported by persons 65 years and older.⁴⁹ Marked alterations in taste, smell, and trigeminal sensation may also be experienced.

Taste threshold sensitivity declines with age and suprathreshold taste intensity perception is affected by age, but the effect on taste quality varies widely. Olfaction is significantly impaired with age, particularly in clients with Alzheimer's disease. Older adults with and without Alzheimer's show impairments in odor memory. Flavor preferences change as age increases, with higher concentrations of sugar, salt, and casein hydrolysate needed to elicit a favorable food preference rating.⁵⁰ Arthritis, peripheral neuropathies, and other tactile impairments may also negatively impact nutritional status. Food preparation becomes more difficult, increasing the likelihood of burns, other injuries, or simply an inability to access food appropriately.^{2,49}

Interventions

The use of flavor and odor enhancers is becoming more widespread as the population ages. Bright contrasting colors in foods, plates, and eating utensils, and well-lit dining areas may also contribute to increased food intake. Hearing-impaired adults may be reluctant to eat in noisy, crowded dining rooms or at large tables because they are unable to hear mealtime conversations and feel increasingly isolated. The appearance and crispness or crunchiness of a food can often make up for some taste and/or smell deficits. If all of the senses are diminished, however, food intake often declines and social contact dwindles. Recognition of these factors and modification of the older person's eating environment may facilitate improved food intake. (See Chapter 15.)

CHRONIC OR INAPPROPRIATE USE OF MEDICATIONS

The long-term use of prescribed or over-the-counter (OTC) medication describes chronic medications use. Inappropriate medication usage refers to medications prescribed or consumed in such a manner that dose, type, or other characteristics are incompatible with the physiology (including the nutritional status) or psychology of the aging person.²

Reason for Concern

In older individuals, the potential for inappropriate use of medications causing drug-nutrient or drug-drug interactions which negatively impact nutritional status is high. In a community setting, 71% of older people reported taking at least one drug daily and 10% reported taking five or more.⁵¹ Women reported taking significantly more drugs than men (median 2.0, range 0 to 13; median 1.0, range 0 to 9, respectively). Individuals older than 85 years were more likely to be taking cardiovascular agents, anticoagulants, vasodilators, diuretics, and potassium supplements. More women than men take nonsteroidal anti-inflammatory agents, antidepressants, potassium supplements, and thyroid replacement medications. Having a single prescribing physician and a single dispensing pharmacy seem to reduce the potential for inappropriate drug combinations.⁵²

Interventions

The potential for both prescribed and OTC drugs to negatively impact nutritional status is well documented.²⁸ The RD must be constantly alert to the possibility of adverse drug events. He or she must also be well versed in the effect that drugs have on nutritional status and be prepared to intervene early in the course of treatment. Drug-alcohol incompatibilities are also recognizable and preventable in most instances. (See Chapter 9.)

SUMMARY

It is important to view each older adult as a unique individual with a singular set of nutritional needs and concerns.^{1,2} Although functional impairment and progressive disability tend to increase with age, generalizations regarding the care of specific clients are, for the most part, inappropriate. Familiarity with each client's individual circumstances and requirements, as well as routine surveillance and continuity of care, offers the most promise for prompt identification of increased risk and timely, appropriate nutrition intervention. Through such practices optimal, achievable nutritional health will be maintained and quality of life maximized.

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Laboratory Assessment of Nutritional Status

Nutrition screening is the process of identifying characteristics known to be associated with nutrition problems. Historically, the greatest emphasis has been on anthropometric data and dietary intake, especially in extended care. However, laboratory assessment is an essential tool to assess nutritional status, to evaluate nutrition intervention programs, and to predict medical outcomes.¹

National trends indicate a declining number of laboratory tests are being ordered in all areas of health care. This trend is a reflection of cost-reduction programs nationwide. Assessment of physical and nutritional status is done primarily through physical assessment and observed dietary intake. Clinical signs and symptoms must be identified in order to justify the request for laboratory tests. Facility protocols or clinical pathways form the infrastructure for ordering more laboratory tests.

IMPLICATIONS OF SELECTED LABORATORY TESTS

All requests for laboratory tests must be justified by the health care team. It is important to remember that no single laboratory test evaluates a client's short-term response to medical nutrition therapy (MNT). In addition, not all tests are appropriate for all clients. For example, creatinine excretion cannot be used to evaluate muscle mass in clients with renal failure because the test assumes normal renal function. The overall medical condition of the client and the current pharmacological intervention strategies must be considered in the interpretation of laboratory tests.

Changes in Nutritional Status

One laboratory test may or may not reflect improved nutritional status once a MNT intervention program has begun. Changes in hydration status significantly impact the laboratory results, and hydration status is commonly overlooked.² To evaluate hydration status a variety of laboratory tests, recent dietary history, and physical assessment will need to be used. *Table 1* lists laboratory

tests that can be used to evaluate hydration status. As a client's hydration and dietary intake change, more than one laboratory test will be required to accurately document changes in nutritional status. A review of support data such as physical findings, changes in anthropometric data, reported symptoms, and nutrition intake will increase confidence in laboratory results.³

Impact of Stress

Interpreting laboratory tests must include the impact of stress on the client. For clients who have short-term emotional stress, physical stress from surgery, or an infection, a change in laboratory values is often seen. For example, an unexpected hospitalization of an older adult due to a fall may result in an elevated fasting blood glucose. Two fasting blood glucose levels above 126 mg/dL are one of the criteria for a diagnosis of non-insulin-dependent diabetes.⁴ If the elevated fasting blood glucose is due to stress, it will return to normal once the stressful situation is resolved.⁵ Unfortunately, some clients are not reevaluated after an appropriate time interval and will have a diagnosis of non-insulin-dependent diabetes as a permanent part of their medical records.

Impact of Other Medical Interventions

Laboratory tests prior to admission to an extended care facility may not reflect the true nutritional status of the client. For example, if a hospitalized client has a very poor iron status, he or she might receive a blood transfusion to improve the iron status in order to shorten the length of stay in the hospital. However, the laboratory tests taken after the blood transfusions reflect the nutritional status of the blood donor, not the client. This is a short-term solution which increases the iron levels while the body begins to utilize nutrients from food. The initial assessment must consider the impact of blood products, the withdrawal of fluids, and other medical procedures that may change the short- and long-term nutritional status of the client.³

TABLE 1: LABORATORY SCREENING FOR HYDRATION STATUS

Lab Test	Normal Values	Dehydration	Overhydration
Osmolality	Adults: 285 - 295 mOsm/Kg H ₂ O	> 295 mOsm/Kg H ₂ O	< 285 mOsm/Kg H ₂ O
Serum sodium	135 - 147 mEq/L 135 - 147 mmol/L	> 147 mEq/L	< 130 mEq/L
Albumin	4.0 - 6.0 g/dL 40 - 60 g/L	Higher than normal	Lower than normal
Urea nitrogen	10 - 20 mg/dL 3.6 - 7.1 mmol/L	Elevated	Lower than normal
BUN:Creatinine ratio	10:1	> 25:1	< 10:1
Urine specific gravity	1.035 - 1.003	> 1.010	< 1.003

Reference Standards

Standard laboratory reports are referenced using suggested normal or age-appropriate values. Remember that most reference standards were developed based on clinical research using primarily young and middle-aged adults. Clinical research on the very young and the very old is limited and reference standards may not apply to these age groups. This is of particular concern in assessing older adults because their norms appear to be slightly lower or higher than the standards. However, acceptable differences have yet to be defined. The RD/DTR must consider how the standards were developed.

In addition, laboratory assessment of nutritional status must be viewed in the unique context of each client. The frequency of tests, technology used, age, disease state, and stress level of the client must be considered. Laboratory tests are an essential tool for improving health outcomes and reducing costs.

Equipment

The most accurate measure of changes in nutritional status is using laboratory test results from the same laboratory. Comparing laboratory test results from different institutions can be like comparing apples to oranges because each institution establishes reference standards and laboratory procedures for each test as suggested by the equipment manufacturer. Other sources of variation include equipment used, the degree of equipment calibration, and the skill of the technician.

CONSIDERATIONS FOR REQUESTING LABORATORY TESTS

As a member of the health care team, it is important to consider the following questions when requesting additional laboratory tests.

1. Will the outcome actually change the nutrition care plan?

Example: An AIDS client's care is being directed by a hospice nurse. The client is not eating and is losing weight. The protein status is likely declining. The client is receiving comfort measures only.

- Requesting a prealbumin test will not change the nutrition care plan.
- Knowing the degree to which the protein status is declining will not change the care plan.

In other words, the client would most likely not receive additional oral nutritional supplements, enteral, or parenteral support as a means to improve nutritional status.

2. Is the test cost-effective?

Managed care mandates cost effectiveness; therefore, laboratory tests must be cost-effective.

Example: Prealbumin and retinol binding protein tests indicate both early depletion of protein stores and repletion of protein stores once an intervention program has begun.

- The half-life of prealbumin is 2 to 3 days and 10 hours for retinol binding protein.

- Another test of protein status is albumin.
- Albumin has a half-life of 21 days and also indicates protein malnutrition.
- It takes at least 3 weeks in adults and longer in the older adult after a MNT intervention program has begun to see an improvement in the albumin.⁶

In managed care with an expected short-term stay, the prealbumin or retinol binding protein are likely the more cost-effective measures because they identify the nutrition problem earlier than the albumin. With the extended care client, the primary concern is to reduce the risk of pressure ulcers with early risk assessment and appropriate nursing and nutrition intervention.

3. Is the nutrition goal for the client consistent with treatment goals and advanced directives?

Example: An 85-year-old female with a 9 g/dL hemoglobin may not be interested in improving her iron status through a MNT intervention program followed by a reevaluation of her iron status.

- The low iron status may be secondary to anemia of chronic disease.
- In anemia of chronic disease the body is unable to utilize dietary or supplemental iron.
- In this case the iron supplement would not be nutritionally or cost effective.

Putting the client on an oral daily supplement for 3 months then rechecking her iron level in 90 days may not be consistent with treatment goals.

CLINICAL LABORATORY VALUES

The system for reporting clinical data is in transition. Most health care professionals learned the conventional units for each laboratory test, and many laboratories continue to use conventional units in their summary reports. Laboratory values may be converted from one system to another by using the unique conversion factor for each laboratory test.

The current preferred method for reporting clinical laboratory data is in terms of International Units (SI Units). "SI Units" is an abbreviation for *le Systeme International d'Unites* or International System. The reason for the change to SI units is to have an international standard for reporting research and medical data. Laboratory values are provided in both conventional and SI units.

Laboratory Tests Used for Nutrition Assessment

Commonly used laboratory tests ordered to evaluate nutritional status are included in this chapter. Summary charts for labs reflecting hydration status, protein status, anemias, and risk for chronic diseases are found in *Table 1* which reviews laboratory screening for hydration status; *Table 2* which summarizes the most commonly used tests to evaluate for protein calorie malnutrition; *Table 3* which summarizes the most commonly used tests to evaluate microcytic anemias, macrocytic anemias, and anemias of chronic disease; and *Table 4* which summarizes the most commonly used tests for coronary heart disease, end-stage renal disease, diabetes mellitus, and liver disease. Values listed for adults typically refer to adults ages 25 to 59 years. Values listed for the older adult refer to individuals over the age of 60 years.

TABLE 2: LABORATORY SCREENING FOR PROTEIN-CALORIE MALNUTRITION STATUS

Lab Test	Normal Values	PCM	AIR	Infection
Retinol Binding Protein	2.6 - 7.6 mg/dL; 1.43 - 2.86 μ mol/L	Low	Unchanged	Unchanged
Prealbumin	19 - 43 mg/dL 190 - 430 mg/L	Low	Very low	Low
Albumin	4.0 - 6.0 g/dL; 40 - 60 g/L	Low	Very low	Low
Cholesterol	< 200 mg/dL; < 5.2 mmol/L	Lower than usual or < 160 mg/dL	Unchanged	Unchanged

KEY:

PCM = protein-calorie malnutrition

AIR = acute inflammatory response

TABLE 3: GUIDE TO ANEMIAS

Lab Test	Normal Values	Fe Deficiency	Megaloblastic Anemia (Folate)	Pernicious Anemia (B ₁₂)	Anemia of Chronic Disease
Hgb	12-16 g/dL F	< 12 g	< 12 g	< 12 g	<12 g
	14-16 g/dL M	< 14 g	< 14 g	< 14 g	<14 g
Hct	33%-43% F	< 33%	< 33%	< 33%	< 33%
	39%-49% M	< 39%	< 39%	< 39%	< 39%
MCV	80-95 μ 3	< 80 μ 3	> 95 μ 3	> 95 μ 3 or normal	Normal
MCH	27-31 pg	< 27 pg	> 31 pg	> 31 pg	Normal
MCHC	32-36 g/dL	< 32 g/dL	Normal	Normal	Normal
Serum Fe	60-190 μ g/dL	< 60 μ g/dL	> 190 μ g/dL	>190 μ g/dL	<60 μ g/dL
TIBC	250-420 μ g/dL	> 420 μ g/dL			<250 μ g/dL
Ferritin: M	12-300 ng/mL	< 12 ng/ml	> 300 ng/mL	> 300 ng/mL	Normal or elevated
Ferritin: F	10-150 ng/mL	< 10 ng/mL	> 150 ng/mL	> 150 ng/mL	Normal or elevated
Serum B₁₂	100-1300 pg/mL	Normal	Decreased	Decreased	Normal
B₁₂ (Schilling Test)	8%-40%		> 8%	< 8%	Normal or decreased
Folate	5-20 μ g/mL		< 5 μ g/mL	>20 mg/mL	Normal or decreased
Hcy	7-22 μ mol/L		Increased	Increased	Normal
MMA	19-76 ng/mL		Normal	Increased	Normal

KEY:

HGB — hemoglobin

Hct — hematocrit

MCV — mean corpuscular volume

MCH — mean corpuscular hemoglobin

MCHC — mean corpuscular hemoglobin concentration

TIBC — total iron binding capacity

Hcy — homocysteine

MMA — methyl malonic acid

TABLE 4: LABORATORY SCREENING FOR OTHER CHRONIC DISEASES

Lab Test	Normal Values	CHD	ESRD	DM	LD
Cholesterol	< 200 mg/dL; < 5.20 mmol/L	> 200 mg/dL		> 200 mg/dL	Rapidly declining levels
HDL	Males > 45 mg/dL Females > 55 mg/dL	< 35 mg/dL		< 35 mg/dL	
Hcy	7 - 22 μ mol/L	Elevated	Elevated		
AST (SGOT)	5 - 40 IU/L; 8 - 20 U/L	Elevated with MI			Elevated
ALT (SGPT)	5 - 35 UI/L 8 - 20 U/L				Elevated
Urea nitrogen	10 - 20 mg/dL 3.6 - 7.1 mmol/L	Elevated with MI	Elevated	Normal or elevated	Declining value
Potassium	3.5 - 5.0 mEq/L 3.5 - 5.0 mmol/L	Normal	Elevated	Normal or elevated	Normal
Creatinine	0.6 - 1.2 mg/dL 44 - 97 μ mol/L	Normal	Elevated	Normal or elevated	Normal
Glucose	70 - 110 mg/dL 3.9 - 6.1 mmol/L	Elevated with MI		> 126 mg/dL	Shifts dramatically

KEY:

CHD — Coronary heart disease

ESRD — End-stage renal disease

DM — Diabetes mellitus

LD — Liver disease

Sources:

Pagana KD, Pagana TJ. *Mosby's Diagnostic and Laboratory Test Reference*. St. Louis, Mo: Mosby; 1997.Litchford MI. *Laboratory Assessment of Nutritional Status*. Palos Verde, Calif: Academy Medical Systems; 1996.**Alanine Aminotransferase (ALT)
(formerly called SGPT)****Normal Values:**

Adults: 5 - 35 IU/L; 8 - 20 U/L (SI)

Older adults: Slightly higher than adults

Nutritional Significance: Alanine aminotransferase (ALT) is an enzyme found primarily in the liver and to a lesser degree in the kidneys, heart, and skeletal muscle. Injury to the liver results in elevated levels of ALT. Serum aspartate aminotransferase (AST) levels are often compared with ALT. The AST:ALT ratio > 1.0 is seen in alcoholic cirrhosis, liver congestion, and metastatic tumor of the liver. The AST:ALT ratio < 1.0 is seen in acute hepatitis, viral hepatitis, and infectious mononucleosis. See *Table 5*.

Alkaline Phosphatase (ALP)**Normal Values:**

Adults: 30 - 85 Imu/mL; 42 - 128 U/L (SI)

Older adults: Slightly higher than adults

Nutritional Significance: Alkaline phosphatase (ALP) is an enzyme found primarily in the bones, liver, and biliary tract. One unique feature of this phosphatase enzyme is that its function is increased in an alkaline environment. The presence of ALP suggests a variety of liver and bone disorders. Isoenzymes of ALP are used to distinguish between liver and bone diseases. See *Table 6*.

TABLE 5: ALANINE AMINOTRANSFERASE**Increased with:**

- Hepatocellular disease
 - Hepatitis
 - Cirrhosis or necrosis
 - Tumor
- Cholestasis

Drugs that may increase levels:

- Acetaminophen
- Allopurinol
- Aspirin
- Cephalosporins
- Clofibrate
- Codeine
- Indomethacin
- Isoniazid
- Methotrexate
- Tetracycline

TABLE 6: ALKALINE PHOSPHATASE**Increased with:**

- Liver disease
 - Obstructive jaundice
 - Hepatocellular
 - Biliary cirrhosis
 - Liver metastasis
 - Hepatitis
- Bone disease
 - Osteogenic sarcoma
 - Metastatic bone cancer
 - Bone fracture
 - Paget's disease
 - Osteomalacia
 - Hyperparathyroidism
- Rheumatoid arthritis
- Leukemia

Drugs that may increase levels:

- Allopurinol
- Antibiotics
- Colchicine
- Indomethacin
- INH
- Methotrexate
- Methyldopa
- Tetracyclines

Decreased with:

- Hypophosphatemia
- PCM
- Hypothyroidism
- Vitamin D excess
- Scurvy
- Pernicious anemia
- Celiac disease

Drugs that may decrease levels:

- Arsenical
- Cyanides
- Fluorides
- Nitrofurantion
- Oxalates
- Zinc salts

TABLE 7: ASPARTATE AMINOTRANSFERASE**Increased with:**

- MI
- Cardiac catheterization and angioplasty
- Hepatitis
- Hepatic cirrhosis or necrosis
- Acute pancreatitis
- Skeletal muscle trauma
- Burns
- Acute renal failure

Drugs that may increase levels:

- Aspirin
- Antihypertensives
- Cholinergic agents
- Anticoagulants
- Digitalis
- Erythromycin
- Isoniazid
- Methyldopa

Decreased with:

- Beriberi
- Diabetic ketoacidosis

**Aspartate Aminotransferase (AST)
(formerly called SGOT)****Normal Values:**

- Adults: 5 - 40 IU/L; 8-20 U/L (SI)
Older adults: Slightly higher than adults

Nutritional Significance: Aspartate aminotransferase (AST) is an enzyme primarily found in the heart, liver, and skeletal muscle cells and to a lesser degree in the kidneys and pancreas. AST enzyme is one of the enzymes tested in the cardiac enzyme series along with creatinine phosphokinase (CPK) and lactic dehydrogenase (LDH). AST levels rise within 6 to 10 hours after a myocardial infarction (MI), peak between 12 to 48 hours, and return to normal in 3 to 4 days unless more cardiac injury occurs. AST levels may be monitored to estimate the time of the myocardial infarction. Other laboratory tests are also used in conjunction with AST. See *Table 7*.

Blood Urea Nitrogen (BUN)**Normal Values:**

- Adults: 10 - 20 mg/dL; 3.6 - 7.1 mmol/L (SI)
Older adults: Slightly higher than adults

Nutritional Significance: The BUN level is directly related to the metabolic function of the liver and excretory function of the kidney. The BUN increases as the kidney's function declines (see *Table 8*). Slightly higher values of BUN seen in older adults are often the result of

an inability to concentrate urine or dehydration. If the BUN continues to increase, it may indicate that kidney function is declining. The BUN is interpreted in conjunction with the creatinine test to assess kidney excretory function. A BUN >100 mg/dL usually indicates serious kidney problems.

The BUN also increases in individuals on a high protein diet or who have gastrointestinal bleeding. Both result in excess amounts of protein in the hepatic circulation and elevated BUN levels result. Dehydration also creates a temporary elevation of BUN. BUN is often used as a measure of hydration status following surgery.

In clients with both kidney disease and liver disease, the BUN may be elevated and then return to normal. This is not a reflection of improved renal excretory function but rather an indication that the liver is unable to form urea. As the liver continues to decline, the blood ammonia levels will rise, while the BUN may remain normal or slightly elevated.

Calcium, Blood

Normal Values:

Adults: (Total) 9.0 - 10.5 mg/dL; 2.25 - 2.75 mmol/L (SI)
(Ionized) 4.5 - 5.6 mg/dL; 1.05 - 1.30 mmol/L (SI)

Older adults: Values slightly decreased

Nutritional Significance: Serum calcium levels are used to evaluate parathyroid function and calcium metabolism. Critical values are < 6 mg/dL possibly leading to tetany and > 14 mg/dL possibly leading to coma.

The total serum calcium value includes both ionized calcium and calcium bound to albumin. When the serum albumin is low, the serum calcium level will also be low. When the serum albumin is high, the serum calcium level is elevated. The total serum calcium level decreases by about 0.8 mg for every 1 g decrease in serum albumin. The formula to adjust calcium for an abnormal albumin is as follows:

$$\text{Adjusted calcium level} = (4.0 \text{ albumin} - \text{actual albumin}) \times 0.8 + \text{actual calcium level mg/dL}$$

When serum albumin levels are low, the ionized form of calcium can be measured. This test is not affected by changes in serum albumin and is considered by some to be a more reliable and sensitive measure of total calcium and in the detection of primary hyperparathyroidism. However, not all laboratories have the equipment to perform the ionized calcium assay. In extended care it is likely to be more cost-effective to estimate the total serum calcium mathematically than to request an ionized calcium level.

See *Table 9* for additional calcium information.

TABLE 8: BLOOD UREA NITROGEN

Increased with:	Decreased with:
• Increased protein catabolism • Hemorrhage into GI tract • Acute MI • Stress • Starvation • Diabetes • Fever • Burns • Impaired renal function • Congestive heart failure • Urinary obstruction • Dehydration • Very high protein diet	• Severe liver damage • Drugs • Poisoning • Hepatitis • Impaired absorption • Celiac disease • Low protein, high CHO diet • Overhydration
Drugs that may increase levels:	Drugs that may decrease levels:
• Allopurinol • Aminoglycosides • Cephalosporins • Furosemide • Guanethidine • Indomethacin • Methotrexate • Methyl dopa • Aspirin • Bacitracin • Carbamazepine • Neomycin • Penicillamine • Propranolol • Spironolactone • Tetracyclines • Rifampin	• Chloramphenicol • Streptomycin

TABLE 9: CALCIUM

Increased with: • Metastatic tumor to the bone • Hyperparathyroidism • Vitamin D intoxication • Sarcoidosis • Milk-alkali syndrome • Addison's disease • Paget's disease of bone • Nonparathyroid PTH producing tumors (eg, lung and renal carcinomas)	Decreased with: • Hypoparathyroidism • Renal failure • Osteomalacia • Hyperphosphatemia • Secondary to renal failure • Hypoalbuminemia • Vitamin D deficiency • Malabsorption • Pancreatitis
Drugs that may increase levels: • Calcium salts • Hydralazine • Lithium • Thiazide diuretics • Parathyroid hormone (PTH) • Thyroid hormone • Vitamin D	Drugs that may decrease levels: • Acetazolamide • Anticonvulsants • Asparaginase • Aspirin • Calcitonin • Cisplatin • Corticosteroids • Heparin • Laxatives • Loop diuretics • Magnesium salts

Creatinine**Normal Values:**Adult males: 0.6 - 1.2 mg/dL; 44 - 97 μ mol/L (SI)Adult females: 0.5 - 1.1 mg/dL; 44 - 97 μ mol/L (SI)

Older adults: Slightly decreased

Nutritional Significance: Creatinine is a by-product of the metabolism of muscle creatine phosphate to form ATP. It is produced at a constant rate determined by the individual's muscle mass and excretory function of the kidney. Often creatinine levels are slightly lower in the elderly due to decreased muscle mass. See *Table 10*.

An elevated creatinine suggests rapid muscle loss from trauma or surgery. Elevated levels also indicate possible renal failure. Critical values > 4 mg/dL indicate serious impairment in renal function. However, a normal creatinine does not always mean unimpaired renal function. Creatinine level is interpreted in conjunction

TABLE 10: CREATININE

Increased with: • Rapid muscle loss • Surgery, trauma • Impaired renal function • Azotemia • Chronic nephritis • Obstruction of urinary tract • Reduced renal blood flow • Shock, dehydration • Congestive heart failure • Diabetes • Rhabdomyolysis	Decreased with: • Muscular dystrophy • Debilitation
Drugs that may increase levels: • Cimetidine • Aminoglycosides • Cephalosporins • Heavy metal chemotherapeutic agents	

with the blood urea nitrogen (BUN). Unlike the BUN, creatinine is not significantly affected by dehydration, malnutrition, or hepatic function.

Hydration status can be elevated using the BUN: Creatinine ratio. The normal ratio is 10:1. Ratios > 25 suggest dehydration and < 10 suggest overhydration. For additional information on creatinine clearance, see Chapter 10.

Folate**Normal Values:** 5 - 20 μ g/mL; 14 - 34 mmol/L (SI)

Nutritional Significance: Folate levels are used to evaluate hemolytic disorders and to detect megaloblastic anemia. Decreased folate levels are associated with megaloblastic anemia, hemolytic anemia, malnutrition, malabsorption syndromes, liver disease, and celiac disease. Elevated levels are often seen in pernicious anemia.

Folate supplementation may mask a B₁₂ deficiency; however, the level at which this occurs is not well documented. Recent studies using folate supplements to reduce elevated homocysteine levels recommend supplementing B₁₂ when a folate supplement is ordered. See *Table 11*.

TABLE 11: FOLATE

Increased with:	Decreased with:
	Drugs that may decrease levels:
• Pernicious anemia • Vegetarianism	• Megaloblastic anemia • Hemolytic anemia • Protein calorie malnutrition • Malabsorption syndromes • Cancer • Alcoholism • Liver disease
	• Alcohol • Aminopterin • Aminosalicic acid (PAS) • Ampicillin • Antimalarials • Chloramphenicol • Erythromycin • Estrogens • Methotrexate • Penicillin • Phenobarbital • Phenytoin • Tetracycline

Glucose, Blood**Normal Values:**

Adults: 70 - 110 mg/dL; 3.9 - 6.1 mmol/L (SI)
 Older adults: Increased slightly

Critical Values: > 400 mg/dL (Renal threshold is about 180 mg/dL.)
 < 50 mg/dL in males; < 40 mg/dL in females

Nutritional Significance: The serum glucose level is a test used to diagnose many metabolic diseases. Serum glucose levels must be elevated at different times of the day for an accurate diagnosis. Non-nutritional factors can elevate fasting blood glucose including stress, infection, caffeine, and smoking. A careful review of the health history of the client and clear instructions for the test are essential to lessen the effects of non-nutritional factors. Elevated blood glucose levels often give falsely low serum sodium values. Use this formula to correct serum sodium values:

$$\text{Na} = \frac{\text{glucose}}{6} \times 2 + \text{Na}$$

The most common diagnosis associated with an elevated blood glucose is diabetes mellitus. A fasting blood

glucose is performed on serum or plasma rather than whole blood. Values will likely vary from the whole blood glucose tests performed on capillary blood using the fingerstick method. Laboratory values using whole blood are likely 10% to 15% higher than capillary values.

In *Report of Expert Committee on the Diagnosis and Classification of Diabetes Mellitus* (1997),⁴ the diagnostic criteria for diabetes was revised to better represent the research findings.

- Categories using fasting glucose levels:

Fasting plasma glucose (FPG) < 110 mg/dL = normal fasting glucose

FPG ≥ 110 mg/dL and < 126 mg/dL = impaired fasting glucose (IFG)

FPG ≥ 126 mg/dL = provisional diagnosis of diabetes

- Categories using oral glucose tolerance test (OGTT)

2h postload glucose (2hPG) < 140 mg/dL = normal glucose tolerance

2hPG ≥ 140 and < 200 mg/dL = impaired glucose tolerance

2hPG ≥ 200 mg/dL = provisional diagnosis of diabetes

- Diagnostic criteria

1. Signs and symptoms of diabetes plus a causal plasma glucose concentration ≥ 200 mg/dL

OR

2. FPG ≥ 126 mg/dL after an 8-hour fast

OR

3. 2hPG ≥ 200 mg/dL during oral glucose tolerance test (75 g load)

See Table 12.

Glucose, Urine**Normal Values:**

Random specimen: Negative

24-hour specimen: < 0.5 g/day or < 2.78 mmol/day (SI)

Nutritional Significance: Urine glucose is part of a routine urinalysis. When blood glucose levels exceed 180 mg/dL, the glucose begins to spill over into the urine. See Table 13.

Hematocrit**Normal Values:**

Females: 33% - 43% (other labs 37% - 47%); 0.33 - 0.43 (SI)

Males: 39% - 49% (other labs 42% - 52%); 0.39 - 0.49 (SI)

Older adults: Values may be slightly decreased.

TABLE 12: GLUCOSE, BLOOD

Increased with: • Diabetes • Cystic fibrosis • Cushing's syndrome (due to increased glucocorticoids) • Hyperthyroidism • Pituitary adenoma • Acute pancreatitis • Adenoma of pancreas • Dehydration, stress, trauma • Chronic liver disease • Hemochromatosis • General anesthesia • CVA, MI	Decreased with: • Liver disease • Poisoning • Hepatitis • Cirrhosis • Metastatic tumor • Pancreatic disorders • Glucagon deficiency • Islet cell carcinoma • Enzyme diseases • Von Gierke's disease • Galactosemia • MSUD • Fructose intolerance • Endocrine disorders • Addison's disease • Hypothyroidism • Water overload • Insulin overdose • Alcoholism
Drugs that may increase levels: • Antidepressants • Beta blockers • Caffeine • Corticosteroids • Dextrothyroxine • Diazoxide • Diuretics • Epinephrine • Estrogen • Isoniazid • Lithium • Pentamidine • Phenothiazines • Phenytoin	Drugs that may decrease levels: • Acetaminophen • Alcohol • Anabolic steroids • Clofibrate • Disopyramide • Gemfibrozil • Insulin • MAOI • Pentamidine • Propranolol • Tolazamide • Tolbutamide

Nutritional Significance: Hematocrit is the percentage of red blood cells (RBCs) in total blood volume and is used along with hemoglobin to evaluate iron status. Usually the hematocrit percentage is three times the hemoglobin concentration in grams per deciliter. This will not be the case if the red blood cells are of abnormal size or hemoglobin concentration.

The hematocrit value is affected by an extremely high white blood cell count and hydration status. It should be evaluated in light of other laboratory values. Individuals living in high altitudes often have increased

TABLE 13: GLUCOSE, URINE

Increased with: • Diabetes mellitus • Cushing's syndrome • Severe stress • Trauma • Surgery • Drug therapy • Infection • Low renal threshold	
Drugs that may cause false-positive tests with Clinitest® but not with Clinistix® or Tes-Tape®: • Acetylsalicylic acid • Aminosalicic acid • Ascorbic acid • Cephalothin • Chloral hydrate • Nitrofurantoin • Streptomycin • Sulfonamides	Drugs that may cause false-negative tests include: • Ascorbic acid (Clinistix®, Tes-Tape®) • Levodopa (Clinistix®) • Phenazopyridine (Clinistix®, Tes-Tape®) • Phenazopyridine (Clinistix®, Tes-Tape®)
Drugs that may increase levels: • Aminosalicic acid • Cephalosporins • Chloral hydrate • Chloramphenicol • Dextrothyroxine • Diazoxide • Diuretics (loop and thiazide) • Estrogens • Glucose infusions • Isoniazid • Levodopa • Lithium • Nafcillin • Nalidixic acid • Nicotinic acid (large doses)	

values. Individuals over the age of 50 commonly have slightly lower levels than younger adults. Individuals with anemia of chronic disease will not be able to maintain normal hematocrit levels because the body lacks the ability to use stored iron. See *Table 14*.

TABLE 14: HEMATOCRIT

Increased with:	Decreased with:
• Dehydration • Erythrocytosis • Shock • Surgery • Trauma • Burns • High altitudes	• Acute blood loss • Overhydration • Anemias • Iron deficiency • Anemia of chronic disease • Pernicious anemia • Megaloblastic anemia • Bone marrow failure • Hyperthyroidism • Hodgkin's disease • Leukemia • Multiple myeloma • AIDS • Cirrhosis
	Drugs that may decrease levels: • Chloramphenicol • Penicillin

Hemoglobin**Normal Values:**

Females: 12 - 16 g/dL; 7.4 - 9.9 mmol/L (SI)

Males: 14 - 18 g/dL; 8.7 - 11.2 mmol/L (SI)

Nutritional Significance: The hemoglobin concentration is a measure of the total amount of hemoglobin in the peripheral blood and is a more direct measure of iron deficiency than hematocrit. Changes in hydration status affect hemoglobin. Overhydration decreases the concentration and dehydration increases the concentration. Living in high altitudes may cause higher hemoglobin values. See *Table 15*.

Homocysteine (Hcy)**Normal Values:** 7 - 22 μ mol/L

Nutritional Significance: Homocysteine levels are increased when folate and vitamin B₁₂ levels decrease. It is an early indicator of megaloblastic anemia. Elevated levels are also associated with increased risk for heart disease and end stage renal disease. Currently, this test has limited use. See *Table 16*.

Iron Level: Serum Fe, Total Iron Binding Capacity (TIBC)**Normal Values:**Serum Fe: 60 - 190 μ g/dL; 13 - 31 μ mol/L (SI)TIBC: 250 - 420 μ g/dL; 45 - 73 μ mol/L (SI)

Nutritional Significance: Most of the iron in the body is found in the hemoglobin of the red blood cells. Dietary iron is absorbed in the small intestine and trans-

TABLE 15: HEMOGLOBIN

Increased with:	Decreased with:
• Dehydration • Polycythemia • COPD • CHF • High altitudes • Severe burns	• Anemias • Iron deficiency anemia • Anemia of chronic disease • Pernicious anemia • Megaloblastic anemia • Sick cell anemia • Hypertension • Cirrhosis • Systemic diseases • Leukemia • Lymphoma • Erythematous • Hodgkin's disease • Sarcoidosis • Systemic lupus • Overhydration • Kidney disease • Chronic hemorrhage • Splenomegaly • AIDS
Drugs that may increase levels: • Gentamicin • Methyldopa	Drugs that may decrease levels: • Sulfonamides • Antibiotics • Aspirin • Antineoplastic • Indomethacin • Rifampin

TABLE 16: HOMOCYSTEINE (Hcy)**Increased with:**

- Renal failure
- Folate deficiency
- B₁₂ deficiency
- Cardiovascular disease
- Homocystinuria

ported to the plasma. In the plasma, iron is bound to transferrin and transported to the bone marrow for production of hemoglobin. The remaining iron is stored as ferritin and hemosiderin in the liver and other tissues for future use. The serum iron reflects the amount of iron bound to transferrin. Total iron binding capacity (TIBC) is a direct measure of transferrin. When TIBC is not available, transferrin can be directly measured. See *Tables 17 and 18*.

Methyl Malonic Acid (MMA)

Normal Values: Serum: 19 - 76 ng/mL
Urine: < 5 mg/day

Nutritional Significance: MMA is a new test used to differentiate between pernicious anemia and folate deficiency. MMA is elevated with pernicious anemia and normal with megaloblastic anemia. Currently this test has limited use.

Osmolality, Serum

Normal Values:

Adults, older adults: 285 - 295 mOsm/kg H₂O

Critical Values: > 320 mOsm/kg H₂O

Nutritional Significance: Osmolality measures the concentration of particles in a solution. Serum osmolality is increased with dehydration and decreased with overhydration. When serum osmolality increases, the

antidiuretic hormone is secreted causing more water reabsorption, a more concentrated urine, and a less concentrated serum. When osmolality is low the body decreases water reabsorption and excretes large amounts of dilute urine.

Serum osmolality is used to evaluate fluid and electrolyte imbalance, seizures, liver disease, hydration status, and acid base balance. See *Table 19*.

Potassium, Serum

Normal Values:

Adults: 3.5 - 5.0 mEq/L; 3.5 - 5.0 mmol/L (SD)

Nutritional Significance: The normal potassium levels within cells are approximately 150 mEq/L compared to 3.5 - 5.0 mEq/L in serum. The level of potassium found outside the cells is the level measured by this laboratory test. As a positively charged ion, potassium is

TABLE 18: TOTAL IRON BINDING CAPACITY (TIBC)

Increased with:	Decreased with:
• Iron deficiency anemia • Polycythemia vera	• Hypoproteinemia • Inflammatory diseases • Cirrhosis • Hemolytic, pernicious, and sickle cell anemia
Drug that may increase levels:	Drugs that may decrease levels:
• Fluoride	• ACTH • Chloramphenicol

TABLE 17: SERUM Fe

Increased with:	Decreased with:
• Pernicious anemia • Aplastic anemia • Hemolytic anemia • B₆ deficiency • Thalassemia • Acute hepatitis • Repeated transfusions • Nephritis • Excessive iron therapy • Hemosiderosis, hemochromatosis • Iron poisoning • Hepatic necrosis • Lead toxicity	• Iron deficiency anemia • Acute and chronic infection • Cancer • Protein calorie malnutrition • Nephrosis • Insufficient dietary iron • Chronic blood loss • Inadequate absorption of iron • Neoplasia • Chronic gastrointestinal blood loss • Chronic hematuria
Drugs that may increase levels:	Drugs that may decrease levels:
• Chloramphenicol • Dextran • Estrogen • Ethanol • Methyldopa	• ACTH • Cholestyramine • Colchicine • Deferoxamine • Methicillin • Testosterone

TABLE 19: OSMOLALITY, SERUM

Increased with:	Decreased with:
• Hyponatremia • Dehydration • Hyperglycemia • Mannitol therapy • Azotemia • Uremia • Ingestion of ethanol, methanol, ethylene, or glycol • Hyperosmolar nonketotic hyperglycemia • Diabetes insipidus • Hypercalcemia • Renal tubular necrosis • Severe pyelonephritis • Ketosis • Shock	• Hyponatremia • Overhydration • Syndrome of inappropriate ADH secretion • Paraneoplastic syndromes associated with lung carcinoma • Excess fluid intake

TABLE 20: HYPOKALEMIA, HYPERKALEMIA

Clinical signs of hypokalemia:	Clinical signs of hyperkalemia:
• Muscle weakness • Cramps • Hypoflexia • Paresthesia • Decreased bowel motility • Hypotension • Cardiac arrhythmia • Drowsiness • Lethargy • Coma	• Confusion • Irritability • Nausea • Vomiting • Intestinal colic • Paresthesia • Abdominal cramps • Muscle paralysis

involved in regulating the osmolality of the extracellular fluid by exchanging with sodium. Its level is essential to maintain the transmembrane electrical potential between the intracellular fluid and the extracellular fluid. See *Tables 20 and 21*.

Protein, Blood: Prealbumin, Serum Albumin, and A:G Ratio

Prealbumin

Normal Values: 19 - 43 mg/dL; 190 - 430 mg/L (SD)

Degree of Depletion:

Borderline:	18 - 15 mg/dL
Mild:	10 - 15 mg/dL
Moderate:	5 - 10 mg/dL
Severe:	< 5 mg/dL

Nutritional Significance: Prealbumin (PAB) is in a class of proteins having rapid turnover with short half-lives (2 to 3 days). Prealbumin is also called transthyretin and thyroxine-binding prealbumin. PAB is a sensitive indicator of protein deficiency and of improvement in protein status with refeeding. When malnutrition is significant, the serum PAB will usually fall below 11 mg/dL. Serum PAB is not greatly affected by mild renal or liver disease, by fluid compartment shifts, or in clients receiving exogenous albumin. However, as renal and liver disease become more significant, the levels are decreased. In addition, iron deficiency does not significantly impact its level.

Serum PAB increases when more than 60% of basal energy expenditure (BEE) needs are met and decreases when less than 45% are met or when there is no oral intake. A reasonable goal of a refeeding program in extended care is to increase serum PAB by at least 2.0 mg/dL to 3.0 mg/dL in 1 week. See *Table 22*.

TABLE 21: POTASSIUM

Increased with:	Decreased with:
• Renal failure • Excessive intake • Cell damage • Burns • Surgery • Crushing injuries • Chemotherapy • Acidosis • Addison's disease • Internal hemorrhage • Uncontrolled diabetes • Dehydration	• PCM • Malabsorption • Diarrhea • Severe vomiting • Renal tubular acidosis • Diuretic therapy • Liver disease with ascites • Chronic stress • Chronic laxative abuse • Cushing's syndrome • IV fluids without adequate K+
Drugs which may increase levels:	Drugs which may decrease levels:
• Aminocaproic acid • Antibiotics • Antineoplastic drugs • Captopril • Epinephrine • Heparin • Histamine • INH • Lithium • Mannitol • K-sparing diuretics • K-supplements	• Acetazolamide • Aminosalicic acid • Amphotericin B • Carbenicillin • Insulin • Laxatives • Aspirin • K-wasting diuretics

Serum Albumin

Normal Values: 4.0 - 6.0 g/dL (labs vary);
40 - 60 g/L (SD)

Degree of Depletion:

Mild:	3.0 - 3.5 g/dL
Moderate:	2.1 - 3.0 g/dL
Severe:	< 2.1 g/dL

Nutritional Significance: Albumin and globulin constitute most of the protein within the body and are measured as total protein. Albumin is synthesized in the liver at a rate of 8 g to 14 g per day. It makes up approximately 60% of the total protein. Albumin provides approximately 80% of colloidal osmotic pressure of the plasma. When albumin decreases, the water in plasma moves to the interstitial compartment. The loss of plasma fluid results in hypovolemia which in turn triggers renal retention of water and sodium. Albumin also serves as a carrier of metals, ions, fatty acids, amino acids, metabolites, bilirubin, enzymes, hormones, and drugs.

TABLE 22: PREALBUMIN

Increased with:	Decreased with:
• Dehydration	• Overhydration • Stress • Infection • Acute catabolic stress • Postsurgery • AIDS
Drugs which may increase levels:	
• Corticosteroids	

Non-nutritional factors can determine albumin levels. Albumin level is dependent upon hepatocyte function. With age and declining liver function, the liver can lose its ability to synthesize albumin. Because the half-life of albumin is 12 to 21 days, significant changes in liver function specific to albumin synthesis may go undetected until after that point. Severely malnourished individuals have greatly decreased levels of serum albumin. However, albumin is a poor indicator of early malnutrition because of its long half-life.

When albumin levels are low, the serum calcium level is also low. When the serum albumin is elevated, the serum calcium is elevated. Refer to the calcium section for more information. Also see *Table 23*.

Albumin:Globulin Ratio

Normal Values: > 1.0

The Albumin:Globulin ratio is a way of comparing two blood proteins. Normally the A:G ratio is greater than 1. It is determined using this formula:

$$\text{A:G ratio} = \frac{\text{albumin}}{\text{total protein} - \text{albumin}}$$

As the globulins increase, the ratio decreases. Decreasing A:G ratios are seen in older adults and with malnutrition. See *Table 24*.

Red Blood Cell Indices: Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin Concentration (MCHC)

Nutritional Significance: The red blood cell indices are used to provide information about the size, weight, and hemoglobin concentration of red blood cells. These tests are used to categorize anemias. See *Table 25*.

TABLE 23: ALBUMIN

Increased with:	Decreased with:
• Dehydration	• Overhydration • Decreased absorption • Pancreatic insufficiency • Malabsorption • Inadequate intake • Impaired synthesis • Congestive heart failure • Cirrhosis • Acute stress • Increased need • Hyperthyroidism • Increased loss • Edema • Ascites • Burns • Pressure ulcers • Hemorrhage • Nephrotic syndrome • Crohn's disease • Sprue • Whipple's disease • AIDS • Protein dilution secondary to excessive IV fluids • Increased capillary permeability • Increased breakdown • Cancer • Trauma • Infection
Drugs that may increase levels:	Drugs that may decrease levels:
• Anabolic steroids • Androgens • Corticosteroids • Dextran • Growth hormone • Insulin • Phenazopyridine • Progesterone	• Ammonium ions • Estrogens • Hepatotoxic drugs

TABLE 24: A:G RATIO

Increased with:	Decreased with:
• Chronic infection • Acute liver disease • Rheumatoid arthritis • Multiple myeloma • Hyperlipidemia • Leukemia	• Malabsorption • Severe liver disease • Nephrotic syndrome • Diarrhea • Severe burns • Protein-calorie malnutrition • AIDS • Lupus

TABLE 25: CATEGORIZATION OF ANEMIAS ACCORDING TO RBC INDICES**Normocytic,* Normochromic** Anemia**

- Iron deficiencies (early stages)
- Chronic illness (eg, sepsis, tumor)
- Acute blood loss
- Aplastic anemia (eg, chloramphenicol toxicosis)
- Acquired hemolytic anemias (eg, from a prosthetic cardiac valve)

Microcytic,† Hypochromic†† Anemia

- Iron deficiency (advanced)
- Thalassemia
- Lead poisoning

Microcytic, Normochromic Anemia

- Renal disease (due to the loss of erythropoietin)

Macrocytic,§ Normochromic Anemia

- Vitamin B₁₂ or folic acid deficiency
- Hydantion ingestion
- Chemotherapy

KEY:

*Normocytic — normal RBC size

**Normochromic — normal color (normal hemoglobin content)

† Microcytic — smaller than normal RBC size

†† Hypochromic — less than normal color (decreased hemoglobin content)

§ Macrocytic — larger than normal RBC size

Mean Corpuscular Volume

Normal Values: 80 - 95 μ 3; 80 - 100 fL (SD)

Mean Corpuscular Value (MCV) is a measure of the average volume of a single red blood cell. MCV is determined by dividing the hematocrit by the total red blood cell count. When the MCV is increased, it suggests the red blood cells are macrocytic. Megaloblastic anemia (B₁₂ and folic acid deficiency) is associated with elevated MCV. A low MCV suggests the red blood cells are microcytic. Iron deficiency anemia and thalassemia are associated with decreased MCV. See *Table 26*.

Mean Corpuscular Hemoglobin

Normal Values: 21 - 31 pg

Mean Corpuscular Hemoglobin (MCH) is a measure of the average weight of hemoglobin within a red blood cell. This value is determined by dividing the total hemoglobin concentration by the total number of red blood cells. MCH is usually elevated when there are macrocytic cells and depressed when there are microcytic cells. See *Table 27*.

Mean Corpuscular Hemoglobin Concentration

Normal Values: 31 - 36 g/dL; 330 - 370 g/L (SD)

Mean Corpuscular Hemoglobin Concentration (MCHC) is a measure of the average concentration of hemoglobin within a single red blood cell. It is derived by dividing the total hemoglobin concentration by the hematocrit. Low levels of MCHC indicate that red blood cells have a deficiency of hemoglobin. These cells are described as hypochromic. When values are normal, the cells are described as normocytic. See *Table 28*.

TABLE 26: MEAN CORPUSCULAR VOLUME

Increased with:	Decreased with:
• Liver disease • Folate deficiency • B₁₂ deficiency • Excess alcohol intake • Sprue • Early pernicious anemia	• Advanced iron deficiency • Chronic blood loss • Iron malabsorption • Excessive iron requirements • Thalassemia • Lead poisoning

TABLE 27: MEAN CORPUSCULAR HEMOGLOBIN

Increased with:	Decreased with:
• Macrocytic anemia	• Microcytic anemia • Fe anemia deficiency • Hypochromic anemia

TABLE 28: MEAN CORPUSCULAR HEMOGLOBIN CONCENTRATION

Increased with:	Decreased with:
• Spherocytosis • High heparin concentration • Severe lipemia of serum	• Iron deficiency • Macrocytic anemia • Chronic blood loss • Thalassemia

TABLE 29: RETINOL BINDING PROTEIN

Increased with:	Decreased with:
• Advanced kidney disease • When calorie and protein needs are met	• Hyperthyroidism • Chronic liver disorders • Zinc deficiency • Cystic fibrosis • End-stage liver disease

TABLE 30: SERUM B₁₂

Increased with:	Decreased with:
• Liver disease • Chronic myelocytic leukemia • Polycythemia urea	• Zollinger-Ellison Syndrome • B₁₂ deficiency • Hypothyroidism • Folate deficiency • Alcoholism • Aplastic anemia • Myeloma • Megadoses of vitamin C • HIV • Transcobalamin I deficiency
	Drugs that may decrease levels: • Antibiotics • Aspirin • Cimetidine • Chlorpromazine • Ranitidine • Cholestyramine • Antifolate drugs • Extended release K preparations

Retinol Binding Protein (RBP)

Normal Values: 2.6 - 7.6 mg/dL; 1.43 - 2.86 μ mol/L

Nutritional Significance: RBP has a 10-hour half-life and is very sensitive to cancer and cachexia. It is a better indicator of short-term and long-term changes than albumin or prealbumin. It is not affected by inflammatory response, but will be affected by end stage liver and renal disease. See *Table 29*.

Serum B₁₂

Normal Values: 100 - 1,300 pg/mL;
75 - 960 pmol/L

Nutritional Significance: Serum B₁₂ is a measure used to identify pernicious anemia and megaloblastic anemia in the older adult. Low levels may reflect poor intake or lack of intrinsic factor. See *Table 30*.

Sodium, Serum

Normal Values: 135 - 147 mEq/L;
135 - 147 mmol/L (SD)

Nutritional Significance: The concentration of sodium between cells is approximately 140 mEq/L compared to 5 mEq/L within the cells. The serum sodium level reflects the relationship between total body sodium and extracellular fluid volume. The concentration of sodium serves as a major determinant of extracellular osmolality. A decreased serum sodium level also results in a decreased extracellular osmolality. An elevated serum sodium level results in increased extracellular osmolality. Elevated osmolality stimulates secretion of the antidiuretic hormone which in turn increases tubular reabsorption of water.

Clinical signs of hypernatremia include dehydration, thirst, agitation, restlessness, hyperflexia, mania, tachycardia, dry mucous membranes, lethargy, hyperactive reflexes, and seizures. As the fluid shifts to compensate for excessive levels of sodium, the serum becomes more dilute. Other laboratory values associated with hypernatremia include urine specific gravity > 1.015 and serum osmolality > 295 mOsm/Kg.

All laboratory values will appear less concentrated when hyponatremia is present. The body compensates for hyponatremia by increasing water loss. As water is lost, the serum sodium as well as other lab values become more concentrated. Other laboratory values associated with hyponatremia include urine specific gravity < 1.010 and serum osmolality < 285 mOsm/Kg. Clinical signs of hyponatremia include muscle cramps, muscle twitching, headache, dizziness, lethargy, confusion, convulsions, stupor, and coma. The changes in the central nervous system are due to fluid shifts from the extracellular spaces to the intracellular spaces which causes the cells to swell. See *Table 31*.

Total Serum Cholesterol, LDL, HDL, and VLDL**Normal Values:**

Adults: <i>Cholesterol</i> :	< 200 mg/dL; < 5.20 mmol/L (SI)
Adults: <i>LDL</i> :	60 - 160 mg/dL (other labs 60 - 130); < 3.37 mmol/L (SI)
Adults: <i>HDL</i> :	
Male:	> 45 mg/dL
Female:	> 55 mg/dL
Adults: <i>VLDL</i> :	25% - 50%

Nutritional Significance: Elevated serum cholesterol has been associated with increased risks for arteriosclerotic vascular disease in young and middle-aged adults. The most accurate results are from a fasting blood cholesterol test. Current research suggests that arteriosclerotic vascular disease is a multifactorial condition. Dietary cholesterol may not be as important as once believed, especially for elderly females with no history of heart disease, hypertension, or diabetes. For older adults with no history of heart disease, an elevated cholesterol is probably not justification for a cholesterol-lowering diet.

Cholesterol is used as an indicator of malnutrition. When cholesterol levels decline along with other indicators of protein status, this suggests nutrition needs are

not being met and the risk for skin breakdown increases. In the elderly, the problem may be chronic failure to thrive, very low intake, or overall declining status. Cholesterol of less than 160 mg/dL may be an indicator of malnutrition and may be a predictor of mortality. See Tables 32, 33, and 34.

Triglycerides**Normal Values:**

Males:	40 - 160 mg/dL; 0.45 - 1.81 mmol/L (SI)
Females:	35 - 135 mg/dL; 0.40 - 1.52 mmol/L (SI)

Nutritional Significance: Triglycerides are a form of fat found in the bloodstream. They are transported in the blood by very-low-density lipoproteins (VLDL) and low-density lipoproteins (LDL). Excess levels of triglycerides are seen in individuals consuming a high-fat diet, high levels of alcohol, and in very-low-fat high-carbohydrate diets. See Table 35.

TABLE 31: SODIUM, SERUM

Increased with:	Decreased with:
• Excessive intake • Primary aldosteronism • Dehydration • Excessive sweating • Diabetes insipidus • Hypercalcemic nephropathy • Hypokalemic nephropathy • Cushing's disease	• Decreased intake • Severe diarrhea • Excessive water intake • Overhydration • Vomiting • Excessive use of IVs of nonelectrolyte fluids • Cirrhosis with ascites • Inappropriate secretion of antidiuretic hormone • Hyperglycemia • Hyperproteinemia • Addison's disease
Drugs that may increase:	Drugs that may decrease:
• Anabolic steroids • Antibiotics • Clonidine • Corticosteroids • Laxatives • Methyldopa	• Carbamazepine • Diuretics • Sulfonylureas • Triamterene • Vasopressin

TABLE 32: TOTAL SERUM CHOLESTEROL

Increased with:	Decreased with:
• Hypercholesterolemia • Hyperlipidemia • Hypothyroidism • Uncontrolled diabetes • Nephrotic syndrome • Stress • High-cholesterol diet • Xanthomatosis • Hypertension • MI • Atherosclerosis • Nephrosis • Biliary cirrhosis	• Malabsorption • Protein calorie malnutrition • Hyperthyroidism • Pernicious anemia • Hemolytic anemia • Sepsis • Stress • Liver disease • AIDS
Drugs that may increase levels:	Drugs that may decrease levels:
• ACTH • Anabolic steroids • Beta blockers • Corticosteroids • Epinephrine • Dilantin • Sulfonamides • Thiazide diuretics • Vitamin D	• Allopurinol • Androgens • Bile-salt binding agents • Captopril • Chlorpropamide • Clofibrate • Colchicine • Erythromycin • Cytomel • INH • Mevacor • Neomycin • Niacin

TABLE 33: HIGH-DENSITY LIPOPROTEIN (HDL)

Increased with:	Decreased with:
• Frequent exercise • Liver disease • Moderate alcohol intake	• High alcohol intake • Smoking • AIDS

TABLE 34: LOW-DENSITY LIPOPROTEIN (LDL) AND VERY-LOW-DENSITY LIPOPROTEIN (VLDL)

Increased with:	Decreased with:
• Hyperlipidemia • High-fat diet	• Malnutrition • Malabsorption • AIDS
Drugs that may increase:	
• Aspirin • Phenothiazines • Steroids • Sulfonamides	

CASE STUDIES**Case Study 1**

An 89-year-old woman is admitted to an extended care facility (ECF) secondary to inability to care for herself any longer. She has a history of rheumatoid arthritis, constipation, and mild dementia. Her diet order is regular. Her medications include enteric-coated aspirin and milk of magnesia q 3 days. She provides a history of weight being stable at 140 pounds until the last month. She has lost weight to her present 136 pounds. Current labs include:

Na	149	K	4.0	BUN	24	Creat	0.8	Glu	120
Alb	3.4	Hgb	10.1	Hct	30.3			MCV	90
Serum Fe	45	TIBC	198	Ferritin	120			Osm	302

Information generated from the labs for the dietetic professional's nutrition assessment includes mild dehydration. The client's Na, BUN, and osmolality are all elevated, consistent with dehydration. Physical examination will help to support this conclusion. Often the albumin level can be falsely high, depending upon hydration status. This client's albumin is borderline normal. One could consider, with the recent weight loss and decline in the activities of daily living including meal preparation, that mild protein calorie malnutrition may be the cause for her lower albumin level. The albumin will be falsely high until rehydration is completed. Improved

TABLE 35: TRIGLYCERIDES

Increased with:	Decreased with:
• Glycogen storage disease • Hyperlipidemias • Hypertension • MI • Hypothyroidism • High-CHO diet or high-fat diet • Poorly controlled diabetes • Nephrotic syndrome • Alcoholic cirrhosis • Alcohol	• Malabsorption • Protein calorie malnutrition • Hyperthyroidism • AIDS
Drug that may increase levels:	Drugs that may decrease levels:
• Cholestyramine	• Ascorbic acid • Asparaginase • Clofibrate • Colestipol

nutrition intake, including meal supervision, will help to replete albumin levels. The client has low hemoglobin, hematocrit, and serum iron levels with normal MCV and ferritin levels. Anemia of chronic disease is the most likely rationale. The body stores of iron are normal; however, there is impaired release of these stores for heme synthesis. Providing iron supplementation would be of little benefit for this client, either from a monetary standpoint or a nutrition perspective and could further aggravate her constipation.

Case Study 2

An 85-year-old male was transferred to an ECF after hospitalization for rehabilitation following a fractured left hip. He has a history of CHF and HTN. He has had an 8-pound weight loss from prehospitalization to admission to the ECF. His diet is no-added-salt. His current medications include bumetanide, clonidine, warfarin, Niferex®, and famotidine. His labs, taken prior to discharge from the hospital, include:

Na	140	K	3.2	BUN	25	Glu	112	Alb	2.8
Hgb	11.3	Hct	34	MCV	78	Ferritin	11	PAB	15

This client has hypokalemia and depleted visceral proteins secondary to stress and surgery. He is on a diuretic, bumetanide, that is a potassium depleter. Review the menu for potassium content and evaluate the client's actual intake. If dietary sources are inade-

quate, potassium supplementation should be considered. The acute phase reactants were preferentially produced in the liver, as opposed to nutritional proteins. If quick initial response to nutrition therapy is desired, serum prealbumin levels should be checked due to their more rapid repletion, secondary to the shorter half-life. This client also has iron deficiency anemia, most likely a result of blood loss from surgery. He is being treated with Niferex® and adequate diet is also recommended. Repeat of Hgb and Hct should be recommended so that timely discontinuation of the iron supplement can be achieved.

Case Study 3

A 79-year-old man is admitted to an extended care facility with chronic renal failure, Type 2 diabetes, hypertension, and peripheral vascular disease. He had been living with his wife until his disease progressed to the point where she could no longer manage his care. He has been eating fairly well, with no change in his dry weight of 152 pounds. His medications at admission include calcium carbonate, Epogen® (at dialysis), Nephrocaps®, diltiazem HCl, and pentoxifylline. His lab work sent from dialysis at admission is:

Na	142	K	5.2	BUN	75	Creat	6.8	Glu	155
CO ₂	19	Cl	104	Alb	3.5	Hgb	12.7	Hct	38.1
Ca	8.4	PO ₄	6.0						

This client's end-stage renal disease (ESRD) and medication administration must be evaluated to accurately interpret the lab results. His elevated BUN and creatinine are consistent with ESRD. The hyperkalemia is mild and should be addressed with diet so that it does not continue to increase and lead to cardiac arrhythmia. The low Hgb and Hct are also consistent with ESRD. Further work-up is not recommended, as the client is on Epogen® provided at dialysis for his anemia. Mild hyperglycemia is present. Blood draw in relationship to meal time needs to be considered. This client may have eaten breakfast prior to dialysis, and this may be representative of a 2-hour postprandial result. If this is the case, adequate control is present at this time. A fasting glucose level can be suggested, as two consecutive fasting blood sugars of 126 are needed before diabetes can be diagnosed. Evaluation of this client's prior diet history for high-phosphorus foods and administration of the phosphorus binder, calcium carbonate, is recommended due to the hyperphosphatemia and hypocalcemia. If evaluation of the diet history reveals low to moderate phosphorus intake, then the administration of the binder should be considered. If the binder was not taken with meals, this could be the cause for the abnor-

mal labs. The RD should instruct caregivers in more effective administration of the calcium carbonate. The albumin level is borderline. Adequate protein intake can help prevent future decline.

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Drug-Nutrient Interactions

DEFINING DRUG-NUTRIENT INTERACTIONS

Drug-nutrient interactions can be described as the influence that medications can have on nutrients. Most common drug-nutrient interactions result from drug-induced changes in nutrient absorption. However, drugs may also either inhibit or induce metabolism of a nutrient or increase the excretion of a nutrient.

The direct effect that a drug may have on nutrient absorption, metabolism, or excretion can have a detrimental effect on the nutritional status of the individual taking the medication. In addition, significant impact on nutritional status can be the indirect influence that a medication may have by altering food intake. A drug may act to increase or decrease appetite, alter the senses of taste and smell, or create adverse gastrointestinal (GI) effects.

Vulnerability to drug-induced nutritional deficiencies is greatest in the older adult, the chronically ill, and anyone with marginal or inadequate nutrient intake. At special risk are those individuals who are on polypharmacy and/or long-term drug therapy. Without proper nutrition management, these high-risk individuals may be subject to nutrient depletion or altered drug response.

DRUG-NUTRIENT ADVERSE SIDE EFFECTS

Appendix 3 lists commonly prescribed drugs and over-the-counter medications. The related drug-nutrient interactions are described along with their nutritional implications, possible side effects, and nutritional actions to take.

DRUG-NUTRIENT INTERACTIONS

Foods and nutrients can have an effect on a drug's efficacy by interfering with its pharmacokinetics. Pharmacokinetics includes the absorption, distribution, conversion to active form, and elimination of medication. Individuals taking vitamins, minerals, and other food supplements concurrently with medication use are

at increased risk for nutrient-induced alterations in pharmacokinetics.

Table 1 shows drug interactions with vitamins, minerals, and other food supplements.

POSITION OF THE AMERICAN DIETETIC ASSOCIATION: VITAMIN AND MINERAL SUPPLEMENTATION

In 1996 the ADA published a position on Vitamin and Mineral Supplementation.

Position Statement

It is the position of The American Dietetic Association that the best nutritional strategy for promoting optimal health and reducing the risk of chronic disease is to obtain adequate nutrients from a wide variety of foods. Vitamin and mineral supplementation is appropriate when well-accepted, peer-reviewed, scientific evidence shows safety and effectiveness.

ADA recommends that eating a variety of foods is the best way to obtain essential nutrients. For those who choose to use supplements, low levels that do not exceed the recommended dietary allowance (RDA) are recommended. Further, ADA recommends that registered dietitians evaluate a client's dietary supplementation practices and provide counseling to prevent excessive intakes or adverse interactions with medical treatments. Health professionals should report harmful effects of dietary supplements to the Food and Drug Administration's (FDA's) Adverse Reaction Monitoring System.

DRUG-NUTRIENT INTERACTIONS AND THE OLDER ADULT

The older adult is at particular risk for drug-nutrient interactions. Several factors contribute to this heightened risk, including drugs, pathological factors, geriatric factors, and nutrition.

TABLE 1: FOOD SUPPLEMENTS AND DRUG INTERACTIONS

<i>Supplement</i>	<i>Drug</i>	<i>Effect</i>
VITAMINS		
Vitamin A	Aluminum hydroxide	Drug-induced precipitated bile acids may decrease vitamin absorption.
	Cholestyramine	Concurrent use may impair vitamin absorption.
	Mineral oil	Concurrent use may interfere with vitamin absorption.
	Warfarin	Megadoses may induce anticoagulant activity.
Vitamin D	Digoxin	Vitamin D-induced hypercalcemia may sensitize the patient to toxic effects of the drug.
	Mineral oil, aluminum hydroxide, cholestyramine	Concurrent use may decrease vitamin absorption.
Vitamin E	Warfarin	Megadoses may enhance anticoagulant activity.
	Mineral oil, aluminum hydroxide, cholestyramine	Concurrent use may decrease vitamin absorption.
Vitamin K	Warfarin	Concurrent use inhibits hypoprothrombic effect of drug.
	Mineral oil, aluminum hydroxide, cholestyramine	Concurrent use may decrease vitamin absorption.
Ascorbic Acid	Estrogen	Megadoses may increase (serum) drug serum levels.
	Haloperidol	Concurrent use may enhance antipsychotic effect of drug.
	Warfarin	Megadoses may decrease prothrombin time.
B₁₂ (cobalamin)	Cimetidine, Neomycin	Concurrent use may reduce absorption of vitamin.
Folacin	Phenytoin	Vitamin replacement in folate-deficient patients may increase drug metabolism.
Thiamin	Aluminum hydroxide	Inactivated by drug
Pyridoxine	Levodopa	Concurrent use reverses anti-Parkinsonian effect.
	Phenytoin	Large doses may reduce anticonvulsant activity.
	Hydralazine, isoniazid, penicillamine	Concurrent use may reverse drug-induced peripheral neuropathy.

continued

TABLE 1: FOOD SUPPLEMENTS AND DRUG INTERACTIONS

<i>Supplement</i>	<i>Drug</i>	<i>Effect</i>
MINERALS		
Calcium	Digitalis	Concurrent use with vitamin D may result in hypercalcemia and may enhance toxic effects of drug.
	Hydrochlorothiazide	Concurrent use with vitamin D may result in hypercalcemia.
	Laxatives (abuse)	Reduced absorption
	Phenytoin	Concurrent use may decrease both drug and calcium bioavailability.
	Verapamil	Concurrent use with vitamin D may counter the antidysrhythmic effect of drug.
Copper	Penicillamine	May induce mineral depletion
Iron	Penicillamine	Concurrent use may decrease drug effectiveness.
	Non-narcotic analgesics (aspirin, indomethacin)	May aggravate or contribute to iron deficiency anemia. (405 g daily in long-term use causes 308 mL fecal blood loss.)
	Calcium carbonate	Concurrent use may impair iron absorption.
Magnesium	Ethanol	Reduced absorption
Phosphorus	Antacids	Reduced absorption
Potassium	Furosemide, hydrochlorothiazide, spironolactone	Monitor for abnormal levels.
	Ethanol	Reduced absorption
Zinc	Penicillamine	Reduced absorption
	Ethanol	Reduced absorption
OTHER SUPPLEMENTS		
Protein or Amino Acids	Levodopa, methyl dopa	Concurrent use may potentially inhibit drug absorption/action.
	Theophylline	Concurrent use may potentially decrease plasma half-life of drug.
Tryptophan	Fluoxetine	Concurrent use may intensify agitation, restlessness, and GI problems.
	Monoamine oxidase inhibitors (MAOI)	Concurrent use may result in confusion, a deterioration in mental status, headaches, agitation, and other adverse effects.
	Tricyclic antidepressants	Variable results are observed when used to augment antidepressant effects.

Adapted from: Morley JE, Glick Z, Rubenstein L, eds. *Geriatric Nutrition: A Comprehensive Review*. 2nd ed. New York: Raven Press Ltd; 1995.

Drug-associated Factors

The multiple pathologic processes associated with old age contribute to an increase in medications prescribed to older adults. In addition, memory loss, confusion, and altered sleep patterns are also treated with prescription drugs. Older adults living at home typically take three or more different prescribed medications daily while those living in health care facilities take up to 10 or more different prescribed medications per day. It is also important to consider the nonprescription drugs like analgesics, antacids, and antihistamines, as well as nutritional supplements, that the majority of home-based older adults take. This polypharmacy pattern in older adults leads to difficulty with compliance and greatly increases the risk for drug-nutrient and drug-drug interactions. In fact, although older adults comprise 12% of the population of the United States, they consume more than 25% of all prescription drugs and experience 30% of the adverse drug reactions reported to the FDA.

Other drug-associated factors contributing to increased risk of drug-nutrient interactions besides polypharmacy include the dose, duration, and frequency of prescribed medications. The physical changes associated with aging (see Geriatric Factors below) could contribute to drug efficacy, and, if the dosage is not adjusted, potential drug toxicity. Drug duration and frequency also need to be monitored, especially in those individuals on “inherited therapy” from drugs started in middle age.

Pathological Factors

The older adult is more likely to have disease conditions such as cardiovascular disease, gastrointestinal malabsorption, liver disease, and/or renal disease. The presence of these diseases increases the likelihood of polypharmacy. In addition, the disease state may have an adverse effect on the pharmacokinetics of a medication.

Geriatric Factors

Regardless of the presence of disease states that could be risk factors for drug-induced nutrient deficiencies, certain age-related factors still put any person over age 65 at significant risk for drug-induced nutritional deficiencies. Anyone over age 75 is at even higher risk, and those over age 85 are at the greatest risk for drug-induced nutrient deficiencies. Age-related gastrointestinal factors include a decrease in gastric emptying, splanchnic (visceral) blood flow, and intestinal motility, and thus a decrease in the absorption of the drug. Age-related changes in the kidney and liver affect drug metabolism and excretion. In addition, age-related body composition changes such as increased adipose tissue

and loss of skeletal muscles can impact drug distribution. Furthermore, drug receptors and tissue sensitivity are affected by age. Thus, age-related factors contribute to alterations in drug efficacy and drug toxicity among older adults.

Nutrition-related Factors

An individual consuming a poor quality diet or one at a compromised nutritional status is more likely to experience nutrition-related side effects associated with drug-nutrient interactions. The older adult often consumes a diet that is not adequate in calories, protein, calcium, and B vitamins and thus is at risk for these nutrition-related side effects.

ENTERAL FEEDINGS AND DRUG-NUTRIENT INTERACTIONS

Drug-nutrient incompatibilities associated with enteral feeding can be classified as physical, pharmaceutical, pharmacological, physiological, and pharmacokinetic.

Physical Incompatibilities

Physical incompatibilities are the changes in formulas that occur when certain medications mix with enteral formulas. Physical incompatibilities include changes in formula texture (granulation or gel formation), flow rate, viscosity, separation, precipitation, or breaking of an emulsion. In general, avoiding acidic medication syrups reduces the risk for physical incompatibilities. (See Chapter 11.) Also, formulas with intact protein are more likely to break the emulsion than are peptide or free amino acid-based enteral products.

Pharmaceutical Incompatibilities

Pharmaceutical incompatibility occurs when the form of a medication is changed upon administration resulting in alteration in the potency, efficiency, or tolerance of the medication or enteral formula. The classic example of pharmaceutical incompatibility is the crushing of enteric-coated tablets or the opening of slow release capsules in an effort to administer the medication through the tube. A list of medications that should not be crushed is published in the journal *Hospital Pharmacy*. The following summarizes medications that should not be crushed.

Enteric-coated

Designed to pass through the stomach intact, with drug being released in the intestines, in order to:

1. Prevent destruction of drug by stomach acids
2. Prevent stomach irritation
3. Delay onset of action

Extended-release

Designed to release drug over an extended period of time. Such products include:

1. Multiple-layered tablets that release the drug as each level is dissolved
2. Mixed-release pellets that dissolve at different time intervals
3. Special (inert) matrixes that contain and slowly release the active drug

Sublingual

Designed to dissolve quickly in oral fluids for rapid absorption by the abundant blood supply of the mouth

Miscellaneous

Drugs that:

1. Irritate the oral mucosa
2. Are extremely bitter
3. Contain dyes or substances that could stain teeth and mucosal tissue

Pharmacologic Incompatibilities

Pharmacologic incompatibility is the most common drug-nutrient interaction. Pharmacologic incompatibilities include enteral feeding intolerance caused by the drug's mechanism of action, antagonistic activity between a drug and a nutrient, and biochemical alterations associated with drug use.

Enteral feeding intolerance may be manifested by nausea, vomiting, GI distention, and diarrhea. The RD/DTR should review all medication for these potential GI side effects. This is especially significant when the formula is suspect for causing the intolerance.

The most common antagonistic relationship between a drug and a nutrient is the incompatibility between vitamin K and warfarin. Serum vitamin K levels should not be excessive and need to remain constant in order for the anticoagulation therapy to be stable. Excessive vitamin K decreases the drug's effect while low vitamin K levels increase the drug efficacy and thus decrease blood clotting times.

The RD should review the vitamin K content of the enteral formula for those individuals on anticoagulation therapy. It is best to avoid formulas containing greater than 75 mg to 80 mg of vitamin K/1,000 kcal. In addition, when enteral formulas are initiated, the changes in vitamin K levels as the enteral formula is being progressed toward the goal rate should be considered and protein monitored.

The final example of pharmacological incompatibility is the altered biochemical levels associated with medication prescribed for enterally fed clients. *Table 2* lists some of the more frequently seen biochemical alterations and the medications associated with these abnor-

malities. Those alterations classified as pharmacological incompatibility are also indicated.

Physiologic Incompatibilities

Physiologic incompatibility involves the nonpharmacologic actions of a medication that result in enteral feeding intolerance. Diarrhea related to increased osmolality is the most common physiologic incompatibility. Changing from medications with high osmolalities to medications with lower osmolalities or simply diluting the medication with water before administration through the feeding tube are methods to employ to avoid physiologic incompatibilities.

Another form of physiologic incompatibility are intolerances caused by the additives used in the production of medications. These additives may not be included in product information and include sorbitol, mannitol, lactose, saccharin, sucrose, flavorings, and dyes. The RD should be aware of the additive content of medications to avoid adverse reactions such as diarrhea, hives, itching, asthma, belching, nausea, or even anaphylactic shock in susceptible individuals.

Pharmacokinetic Incompatibilities

Pharmacokinetic incompatibility occurs when the enteral formula alters the absorption, distribution, metabolism, or elimination of the drug or, conversely, when the drug alters nutrient function. The most extensively studied of the pharmacokinetic incompatibilities associated with enteral feedings is phenytoin. As a result, it has been recommended that enteral feedings occur 1 to 2 hours before and after the phenytoin dose. Other approaches include providing the phenytoin intravenously or in capsule form to enhance absorption and frequent monitoring of the serum levels of phenytoin and adjusting doses to maintain therapeutic levels.

ALCOHOL

Many older adults consume alcohol on a regular basis and may not consider the effect that alcohol can have on nutritional status and on medications. Older adults have a lower tolerance for alcohol because aging is associated with lower total body water and, therefore, blood alcohol becomes more concentrated in the older adult.

The physical effects of alcohol may impact several nutrients. One consequence of long-term alcohol abuse, Wernicke-Korsakoff Syndrome, is associated with thiamin deficiency. Absorption or utilization of vitamins B₆, B₁₂, and C is affected by regular alcohol intake. In addition, increased iron absorption and decreased zinc absorption may occur.

Because alcohol is distributed throughout the body and is able to cross all membrane barriers, its likelihood to interact with a drug's mechanism of action is great.

TABLE 2: COMMON BIOCHEMICAL ABNORMALITIES ASSOCIATED WITH MEDICATIONS PRESCRIBED FOR ENTERALLY FED PATIENTS

Serum Glucose	
Hyperglycemia	Morphine, phenytoin, thiazides,* corticosteroids,* estrogen,* phenothiazine,* probenecid,* clonidine,* chemotherapeutic agents
Hypoglycemia	Acetaminophen,* monoamine oxidase inhibitors,* sulfonamides,* phenylbutazone,* propranolol,* barbiturates*
Serum Potassium	
Hyperkalemia	Spironolactone,* penicillin G potassium
Hypokalemia	Ampicillin, carbenicillin, piperacillin, ticarcillin, amphotericin,* thiazides,* furosemide,* diuretics,* laxatives*
Serum Sodium	
Hypernatremia	Penicillin G sodium, medications with large volume normal saline
Hyponatremia	Laxatives,* diuretics,* probenecid,* amphotericin, potassium-sparing diuretics,* thiazides, furosemide*
Serum Magnesium	
Hypermagnesemia	Magnesium-containing antacids in patients with renal dysfunction
Hypomagnesemia	Amphotericin, cyclosporin, thiazides,* furosemide,* cisplatin, ciprofloxacin, probenecid, carbenicillin, pentamidine
Serum Phosphorus	
Hyperphosphatemia	Chemotherapeutic agent-induced cell lysis,* excess glucose administration with medications
Hypophosphatemia	Sucralfate, corticosteroids, furosemide,* thiazide*
Calcium Losses	Furosemide,* triamterene,* probenecid, corticosteroids, indomethacin
Serum Lipids	
Hypertriglyceridemia	Cyclosporin,* corticosteroids, thiouracil, chlorpromazine

* Classified as pharmacologic incompatibility

Used with permission: Rombeau JL, Rolandelli RH. *Clinical Nutrition Enteral and Tube Feeding*. 3rd ed. Philadelphia, Penn: W B Saunders Co; 1997.

The RD should review all medication for the need to restrict or avoid alcohol, as well as the alcohol content of the medication.

HIGHLY PROTEIN BOUND

A highly protein bound drug is highly attached to serum proteins. (See *Appendix 3*.) If serum albumin levels are low, then there are fewer binding sites for the highly protein bound drug. The older adult with diminished serum protein, liver, or renal function will have an increased free fraction of the drug. This increased bioavailability of the drug results in increased drug effect. Additionally, the drug not bound to plasma proteins is excreted in the urine. The half-life for the highly protein bound drug may be shorter with severe hypoalbuminemia as the drug is eliminated faster. Thus, the highly protein bound drug may have an increased bioavailability but a shorter duration of action. This is especially significant with the concomitant administration of several drugs that are highly protein bound, since altered serum drug concentration may result.

With good oral protein intake, serum albumin monitoring may not be necessary. With compromised oral protein intake, serum albumin monitoring may be prudent. If available, prealbumin is the preferred monitor as it reflects serum protein status for 2 to 3 days prior to testing and is not significantly altered by hydration or early liver disease.

PRESSOR AMINES

Amines are nitrogen-containing organic compounds which are naturally present in foods. Some amines are biologically active. Monoamines are called pressor amines, or vasoactive amines, due to their action of constricting blood vessels. Examples of pressor amines include tyramine, histamine, dopamine, serotonin, and norepinephrine. Biologically active amines do not normally pose a health hazard since they are broken down by oxidases. Certain drugs, however, inhibit the work of the oxidases in the body. These drugs are called oxidase inhibitors. Monoamine oxidase inhibitors (MAOIs) are a group of drugs which interfere with the work of monoamine oxidase (MAO). MAO is found in the liver, the GI tract, and adrenergic nerve endings. It metabolizes (oxidizes) tyramine, histamine, and other pressor amines before they reach the systemic circulation. MAOIs block MAO activity, causing an increase in the concentration of unoxidized pressor amines, such as tyramine, in the body. The presence of unoxidized pressor amines causes constriction of the blood vessels which results in abnormal elevation of blood pressure, headaches, mood elevations, and possible death. When a drug with known MAOI activity is taken, foods high in pressor amines, such as tyramine, need to be avoided. (See *Tables 3 and 4*.)

CAFFEINE

Caffeine stimulates the central nervous system and may cause nervousness, irritability, and insomnia. Caffeine causes the heart to beat faster, which could be an unwanted stress. Caffeine also crosses the placenta and may effect the heart rate and breathing of a baby in utero.

Most individuals are aware of the amount of caffeine they can tolerate before experiencing jitters, insomnia, or heart palpitations. However, medications may interact with caffeine to enhance its effects. Some medications slow the elimination of caffeine; others, like bronchodilators whose mechanism of action (dilating airways) is similar to caffeine, increase elimination. Caffeine intake along with bronchodilators could have a multiplying effect on the drug, similar to an overdose.

Table 5 outlines the drug-nutrient interaction issues associated with caffeine along with signs and symptoms of clinical excesses and withdrawal.

When limiting caffeine in the diet, it is important to consider over-the-counter (OTC) medications that may be high in caffeine including appetite suppressants, caffeine pills, analgesics, and allergy/cold relief tablets.

GRAPEFRUIT JUICE

Grapefruit juice contains the flavonoids (naringenin, quercetin, kaempferol). Naringenin appears to interfere with liver enzymes that facilitate the metabolism of certain drugs including calcium channel blockers. Felodipine (Plendil®) was investigated by assessing the drug levels after administration with water, orange juice, and grapefruit juice. While neither water nor orange juice had a measurable effect on blood levels of felodipine, grapefruit juice tripled the serum levels of the drug. This increase in felodipine is associated with headaches, flushing, and light-headedness.

Other drugs associated with increased bioavailability when taken with grapefruit juice include Verapamil® (Calan), Procardia® (Nifedipine), Seldane® (Terfenadine), and Sandimmune® (Cyclosporin).

ALTERNATIVE THERAPIES

Health care reform is driving many changes in how consumers make health care decisions. Because today's consumers are focusing much of their energy on staying well, they are more aware of preventive measures, including one of the major trends today — alternative medicine. Although Eastern cultures have used herbal and alternative therapies for thousands of years, their philosophies about health differ dramatically from those of modern Western medicine. Some nutrition therapies are valid; others are not.

TABLE 3: PRESSOR AMINES: CLINICAL GUIDELINES**Drug-Nutrient Interaction Issues**

Altered pressor amine levels may occur with:

- Classic nonselective MAOIs prescribed for depression
- Amphetamines
- Decongestants
- Cold medications
- Caffeine
- Other medications:
 - Furaxolidone
 - Procarbazine
 - Selegiline

Non-Drug-Nutrient Interaction Causes of Elevated Pressor Amines

- Cardiovascular disease
- Chronic alcoholism/liver disease

Clinical Signs/Symptoms of Excess Pressor Amines

- High blood pressure
- Neck stiffness or soreness
- Nausea/vomiting
- Severe headaches
- Flushing/sweating (sometimes with fever)
- Increased heart rate or decreased heart rate
- Unusual tolerance to light
- Irregular heartbeat, heart failure (severe hypertensive crisis)
- Intracranial hemorrhage (possibly fatal in severe hypertensive crisis)

Intervention

- Avoid foods high in tyramine and other pressor amines.
- Monitor blood pressure frequently.
- Observe and interview the individual for signs of pressor response.
- Physician will discontinue MAOI as appropriate:
 - In cases where frequent headache reported (initial stage of hypertensive crisis)
 - (Immediately) in cases where rapid violent throbbing or fluttering of the heart reported

TABLE 4: PATIENT EDUCATION GUIDE FOR PRESSOR AMINES

- MAO inhibitors (MAOIs) block MAO activity, causing an increase in the concentration of unoxidized pressor amines, such as tyramine, in the body. The presence of unoxidized pressor amines causes constriction of the blood vessels which results in abnormal elevation of blood pressure, headaches, mood elevations, and possibly death.
- When a drug with known MAOI activity is taken, foods which are high in pressor amines, such as tyramine, need to be avoided.
- Generally, protein-rich foods which have been aged, dried, fermented, pickled, and/or smoked should be eliminated from the diet.
- When purchasing foods, be sure to select only fresh foods. Prolonged storage and food spoilage will increase the tyramine content of the items.
- Talk to your physician. Make sure he or she is aware of all medications you are taking. Report any medication side effects.

Foods High in Tyramine and Other Pressor Amines to Avoid

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> • Processed meats/luncheon meats: <ul style="list-style-type: none"> — Hot dogs — Bacon — Sausage — Liverwurst — Ham — Salami — Bologna — Pepperoni — Corned Beef — Kielbasa sausage | <ul style="list-style-type: none"> • Aged and processed cheeses • Blue cheese • Liver • Anchovies • Pickled herring • Tuna • Chinese pea pods/snow peas • Fava (Italian broad) beans • Sauerkraut/kim chee • Fermented soy bean products • Overripe fruits/banana peel | <ul style="list-style-type: none"> • Canned soups containing MSG • Meat extracts (broths, bouillons, gravies) • Yeast extracts • Sourdough bread • Herbed teas • Malt beverages (including beer, ale) • Chianti • Burgundy, red, and white wines • Port • Sherry • Vermouth |
|---|---|--|
-
- In addition, do not consume more than 1 small serving (1/4 cup or 2 oz) per day of any of the following: avocado, peanuts, raspberries, soy sauce, chocolate, yogurt, cream, or any unpasteurized dairy products.
 - Limit caffeine to less than 500 mg per day. Caffeine acts as a weak pressor agent
 - Avoid alcohol entirely. The consumption of alcohol, especially the beverages listed, significantly increases risk of a hypertensive crisis.

TABLE 5: CAFFEINE: CLINICAL GUIDELINES**Drug-Nutrient Interaction Issues**

Caffeine may enhance the adverse effects of the following drugs:

- Cardiac regulators: calcium channel blockers, antihypertensives, T12 antagonists
- Antipsychotics/antidepressants/antianxiety medications
- Antiulcer agents
- Diuretics
- Insulin/oral hypoglycemics
- Bronchodilators
- Stimulants/sedatives
- Anticonvulsants
- NSAIDs
- Pain relievers
- Decongestants
- Potassium supplements

Clinical Excess Signs/Symptoms

- Increased heartbeat
- Irritability
- Nervousness
- Insomnia
- Increased urination
- Hyperglycemia in diabetics
- Decreased calcium absorption
- Decreased iron absorption
- Increased gastric acid secretion/GI irritation
- Increased free fatty acid concentrations
- Pressor activity (see Pressor Amines Clinical Guidelines)

Clinical Withdrawal Signs/Symptoms

- | | |
|------------|----------------|
| • Nausea | • Headache |
| • Vomiting | • Irritability |

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The alternative medicine trend is here to stay, and as practitioners, the dietetics professional needs to become educated on alternative nutrition interventions. Clients are already using some of these therapies and the RD/DTR needs to accept the blending of “East meets West.”

The use of herbal remedies, food supplements, or nonprescription hormones should be taken very seriously. Adverse drug reaction to prescription drugs is the sixth leading cause of death in the United States. Now herbal remedies, food supplements, and nonprescription hormones are available OTC and add to an already dangerous situation. It is prudent to proceed with caution and be very certain of the validity of the information about alternative therapies. A number of these therapies may not be successful and, in fact, may be questionable. The lack of supportive research data to validate claims is a concern, but research is now becoming available on herbal remedies and medication interactions. See *Tables 6, 7, 8, and 9* for specific information.

There are many good sources of information on alternative medicine and alternative nutrition. The best source of information is the ADA practice group Nutrition in Complimentary Care. Additional resources are listed at the end of this chapter. *Box 1* presents

alternative nutrition therapies and the claims that have been made for each.

REGULATORY COMPLIANCE**Federal Guidelines**

Federal OBRA guidelines specify 10 classifications of drugs which contribute to nutritional deficiencies. See *Appendix 3* for examples from each drug classification.

- Antacids
- Anti-inflammatory
- Anticonvulsants
- Antineoplastic drugs
- Cardiac regulators (antiarrhythmics)
- Diuretics
- Laxatives (chartics)
- Oral hypoglycemics (antidiabetics)
- Phenothiazines
- Psychotropic drugs (psychotherapeutic agents)

TABLE 6: COMMON HERB THERAPIES

Herb	Active Ingredient	Health Claim/Use	Dosage	Notes Safety/Side Effects
Aloe (or Aloes) <i>Aloe ferox</i> <i>Aloe barbadensis</i>	Anthracene derivatives	Laxative in acute constipation. Do not use for chronic constipation. No evidence for other internal effects	Daily dose is 0.05-0.2 g dry extract. Lethal dose is 1 g/day for several days.	May cause cramps or diarrhea Do not take over long period of time (may cause electrolyte imbalance). Do not use if pregnant or have a GI illness. May alter GI absorption of some drugs.
Aloe vera gel <i>Aloe barbadensis</i>	Polysaccharides	Use externally for treatment of burns and wounds. Cosmetics (astringent, emollient)	Use until healed to prevent scarring.	Allergy, though rare, may occur in susceptible individuals. Processing and storage may affect retention of activity.
Cayenne <i>Capsicum annuum</i>	Capsaicin	Cream acts as a local counterirritant for pain relief. Used for arthritis, herpes zoster, toothache, diabetic neuropathy, and muscular skeletal pain. Internally, acts as gastric stimulant and carminative. Evidence for decreasing platelet aggregation or decreasing cholesterol in humans is lacking.	3-5 times daily; massaged into the skin until no residue remains	Strong irritant. Avoid contact with eyes. Wash hands thoroughly after applying cream.
Echinacea <i>E. angustifolia</i> <i>Echinacea purpurea</i>	Polysaccharides, flavonoids, alkalimides, and essential oils	Prophylaxis and treatment of upper respiratory tract infection and flu through enhancement of immune function Topically may provide antioxidant protection against UVA and UVB rays.	Do not take continuously. Stop when no longer sick. Take during exposure to virus. 250 mg extract 1 tsp once or twice/day	None expected although allergic reaction possible Efficacy of oral capsules and teas questionable AIDS patients should avoid

continued

TABLE 6: COMMON HERB THERAPIES

Herb	Active Ingredient	Health Claim/Use	Dosage	Notes Safety/Side Effects
Ephedra <i>Ephedra sinica</i> (<i>Ma Huang</i>)	Ephedrine and other alkaloids	Decongestant, bronchial asthma CNS stimulant Though it may decrease appetite, not recommended for weight loss	8 mg serving No more than 24 mg/day Do not use longer than 7 days.	May increase blood pressure, heart rate, heart palpitations Causes dry mouth Caffeine increases effect Should not be taken by patients with heart disease, high blood pressure, thyroid disease, or diabetes Avoid if using antihypertensive or antidepressant drugs.
Ginkgo Biloba <i>Ginkgo Biloba extract</i> (<i>Egb</i>)	Analytically controlled to contain 24% flavenoid glycosides (quercetins) and 6% terpene lactones	Antioxidant, increases circulation Inhibition of platelet activating factor Cerebral insufficiency (particularly in geriatric patients): —concentration —memory —vertigo —confusion —dizziness —depression —tinnitus —headache —Alzheimer's disease Intermittent claudication in peripheral arterial insufficiency	40-80 mg three times daily Must be taken consistently for 12 weeks to be effective	Safety well established. Minimal side effects include headache, GI problems, and dizziness. Patients with bleeding disorders should not use. Avoid if pregnant or nursing. Overdose may cause irritability, restlessness, diarrhea, and vomiting. Fruit pulp and raw seeds toxic. Contact with pulp may cause dermatitis. Use standardized ginkgo biloba extract (GBE). Use caution if already taking anticoagulants.
Ginseng <i>Panax ginseng</i> (<i>Asia</i>) <i>Panax quinquefolius</i> (<i>America</i>)	Triterpenoid saponins (ginsenosides, panaxosides)	Tonic or adaptogenic; in Korea and China used as a relaxant or stimulant To reduce risk of various human cancers Regulates plasma glucose in Type II diabetics Use as an ergogenic aid in healthy men and women (not supported by clinical research)	15-20 grains of powdered herb Need for standardized doses of each type of ginseng	Generally safe. Mild side effects include headache, insomnia, anxiety, skin rashes, diarrhea. Caffeine may increase effects. Rare: Severe effects (asthma attacks, increased blood pressure, heart palpitations, menstrual changes)

continued

TABLE 6: COMMON HERB THERAPIES

Herb	Active Ingredient	Health Claim/Use	Dosage	Notes Safety/Side Effects
Ginseng (continued)				Avoid if pregnant or nursing. Quality root expensive. Concentration of ginsenosides varies among brands and preparations. There are numerous varieties of ginseng: • Oriental ginseng (<i>Panax ginseng</i>) is native to the Orient, primarily China and Korea. Today almost all Oriental ginseng is cultivated. • White ginseng is the name given to the natural unprocessed ginseng root. • Red ginseng is ginseng that has been processed thus turning a red color. There is no chemical difference between the two varieties. • American ginseng (<i>Panax quinquefolius</i>) grows wild, but is considered an endangered species due to widespread harvesting. Almost all American ginseng is now cultivated. • Siberian ginseng (<i>eleutherococcus senticosus</i>) is often labeled as ginseng but is not a true ginseng. It has some of the same properties but is relatively inexpensive compared to real ginseng. • Wild Red American ginseng is not ginseng at all.

continued

TABLE 6: COMMON HERB THERAPIES

Herb	Active Ingredient	Health Claim/Use	Dosage	Notes Safety/Side Effects
Saw Palmetto <i>Serenoa repens</i>	Liposterolic extract containing 85%-95% fatty acids and sterols (betasitosterol)	As an antiandrogen for benign prostatic hyperplasia. May increase urinary flow, reduce residual urine, and decrease frequency of urination.	160 mg twice daily	No side effects reported If symptomatic, see doctor to rule out prostate cancer.
St. John's Wort <i>Hypericum perforatum</i>	Hypericin xanthenes and flavenoids 0.3% hypericin	Mild to moderate depression, but not severe depression (suicidal, psychotic, or severe sadness) May also have antiviral, antibacterial, and wound-healing activity.	300 mg three times daily Must take consistently for 4 weeks	GI irritation, most common complaint, may be lessened with food in some patients. Do not use other psychoactive medications. Photosensitivity characterized by dermatitis and inflammation of mucous membranes at high levels of intake or prolonged use Prescription drug in Germany for depression
Valerian root <i>Valeriana officinalis</i>	Valepotriates, volatile essential oils	Sedative and sleep aid Reduces nervous tension, stress, anxiety, and restlessness May reduce sleep latency and improve sleep quality	Follow directions with smallest possible dose.	Mild headache or upset stomach. Too much may cause severe headache, nausea, morning grogginess, blurry vision. Do not use if taking sedatives or anxiolytics. Mechanism of action similar to the benzodiazepines, but non-addictive and ability to drive or operate machinery not affected.

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TABLE 7: COMMON SUPPLEMENT/FOOD/HERB THERAPIES

Supplement/ Food	Active Ingredient	Health Claim/Use	Dosage	Notes Safety/Side Effects
Black Cohash <i>Cimicifuga racemoosa</i>	Triterpenoid glycosides, isoflavones, and aglycones	Suppressed LH (but not FSH) secretion in patients receiving 8 mg/d for 8 weeks. Binds to estrogen receptors in rat uteri. One study indicated relief of hot flashes and improved mood. Eases menopause symptoms	Follow directions starting with smallest dose.	Large doses cause dizziness, nausea, headaches, stiffness, and trembling. Patients should not use if taking blood pressure medication or if they have heart problems.
Chinese Angelica <i>Angelica sinensis</i> (Dong quai)	Coumarin derivatives	No clinical backup for assertions that it relieves hot flashes and vaginal dryness	Follow directions starting with smallest dose.	Efficacy and safety inconclusive. Contains photoreactive substances, so avoid overexposure to sunlight.
Licorice Root <i>Glycyrrhiza glabra</i>	Beta-sitosterol	May be a weak estrogen, but no studies confirm estrogenic effects in humans.	Follow directions starting with smallest dose.	Large amounts taken over a long period of time can lead to high blood pressure and edema. Patients with kidney disease or glaucoma should avoid use. Do not take with blood pressure medication.
Phytoestrogens <i>Soy and soy products, corn, green beans, lemon and orange peels, nuts and seeds, brown rice, flaxseed oil</i>	Isoflavones (genistein) phytosterols, saponins, lignins	Compounds have very mild estrogenic effect. May improve vaginal dryness. Effect on hot flashes inconsistent.	Follow directions starting with smallest dose.	No known toxicity or side effects
Strawberry <i>Fragaria</i>	Boron	Boron may increase level of circulating estrogen.	Follow directions starting with smallest dose.	No known toxicities. May cause allergic reaction
Wild Yam Root <i>Dioscorea villosa</i>	Diosgenin	Diosgenin has no hormonal activity and is not converted into either estrogen or progesterone in the body. No clinical trials to assess efficacy have been published.	Follow directions starting with smallest dose.	No known toxicity; however, Japanese use an extract (dioscin) as a fish poison.

TABLE 8: COMMON HORMONE THERAPIES

Hormone	Health Claim/Use	Dosage	Notes Safety/Side Effects
DHEA	Converted in the body to testosterone and estrogens	25-50 mg Check blood level before treating.	Amount of estrogen and testosterone that the body makes from DHEA varies among individuals. Precursor to testosterone and estrogen Side effects may include acne, hair growth, low energy, irritability, insomnia, headache, menstrual irregularity, increased ocular pressure, tachycardia, increased heart rate, and palpitations. Untested in long-term clinical trials Available OTC. The National Institute of Aging (NIA) does not recommend taking supplements of DHEA.
Melatonin	Regulation of the sleep-wake schedule, (eg, jet lag). May increase sleep efficiency and decrease sleep onset in persons with insomnia. Claims to protect cells from free radical damage, boost immunity, and prevent cancer. Declines with age. Only works when deficient.	Varies greatly. (See <i>Table 10.</i>)	Possible adverse side effects include inhibition of fertility, suppression of male sex drive, hypothermia, and retinal damage. High doses may cause excess sleepiness, confusion, and headache the next morning. Long-term effects unknown. Many claims unsubstantiated in human studies. Available OTC. The NIA does not recommend taking supplements of Melatonin.
Testosterone	Claims to maintain muscle mass; reduce total cholesterol, increase energy and libido Check blood level before starting treatment.	Check blood level before treating.	OTC strength and purity not regulated Can result in enlargement of prostate gland, harmful cholesterol levels, psychological problems, infertility, and acne Speeds production of RBC, which may thicken the blood and increase risk of strokes Testosterone is available only by prescription (patch, pill, injection).

TABLE 9: MELATONIN THERAPY**Melatonin Supplement vs Natural Production of Melatonin****Melatonin Supplementation Should Be Restricted in High-risk Group**

Supplement Dosage (mg)	Equivalent to Amount Produced by the Body During:	Restrict	Potential Problem
0.75	25 days	Persons taking steroids and thyroids	Melatonin may counteract effect of these drugs.
2.0	65 days	Pregnant women	Untested unknown risks.
3.0	100 days	Women wanting to conceive	Doses greater than 10 mg may prevent ovulation.
5.0	166 days	Nursing mothers	Melatonin transmitted through breast milk.
10.0	333 days	People with severe mental illness	Symptoms may be exacerbated.
		People with severe allergies, autoimmune disease, or immune system cancers (lymphoma and leukemia)	Melatonin may stimulate the immune system, thereby exaggerating allergies, autoimmune response, and immune cells.
		Normal children of all ages	Already have high levels of melatonin.

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BOX 1: Alternative Therapies and Claims for Use

<i>Herb</i>	<i>Claim for Use</i>	<i>Herb</i>	<i>Claim for Use</i>
Alfalfa	Food supplement	Damiana	Sexual stimulant and for impotence
Aloe	Blend for digestive problems and the immune system	Devils Claw	Arthritis and rheumatism
Astragalus	High blood pressure	Dulse	Thyroid dysfunction
Barley Grass	Relieving pancreatitis	Dong Quai	Maintains female hormones and regulates monthly cycles
Bayberry	Varicose veins	Echinacea	Lessens the severity of colds and flu
Bee Pollen	Boosts the natural defense system	Eyebright	Hay fever and relief of eye inflammations
Bilberry	Support healthy eyes	Fennel Seed	Reduces inflammation and calms coughs
Black Cohosh	Female complaints, "the blues"	Fenugreek	Intestinal problems; aphrodisiac
Black Walnut	Hull is a natural laxative.	Fo-Ti	Regeneration and the heart
Blessed Thistle	Improves circulation	Garlic (odorless)	Reduces infection
Blue Cohosh Root	Women's menstrual cramps	Ginger Root	For the stomach; helps cleanse kidneys
Bromelain	Aids digestion with a digesting enzyme that breaks down fat	Ginkgo Biloba	Prevents and slows the aging process
Burdock Root	Blood purifier	Ginseng	Body balance and endurance
Butchers Broom	Inflammation and circulation	Goldenrod	Weak digestion
Cascara Sagrada	Chronic constipation	Goldenseal Root	Natural antibiotic
Catnip	Mild sedative; controls diarrhea	Gotu Kola	Memory and nerves
Cayenne	Improves circulatory system	Grape Seed Extract	Powerful antioxidant
Chamomile	Flower to relieve menstrual cramps	Guar Gum	Curbs the appetite
Chickweed	Blood purifier; rich in potassium	Guarana Seed	Fights fatigue
Coenzyme Q10	For heart; retard the aging process; alleviate gum pain	Hawthorne Berries	Strengthens the heart
Comfrey Leaf	For kidney disease	Hops	Tones the liver; mild sedative and pain reliever for children
Cornsilk	For hypertension	Hydrangea	Reduces inflamed prostate and urinary tract infections

continued

BOX 1: *Alternative Therapies and Claims for Use*

<i>Herb</i>	<i>Claim for Use</i>	<i>Herb</i>	<i>Claim for Use</i>
Juniper Berries	Cleanses the kidneys	Sage	Inflammation of the mucous membranes, mouth, and gums
Kaya Kaya-root	Reduces nervousness and promotes a feeling of well-being	Sarsaparilla Root	Arthritis and male sexual potency
Kelp/Dulse	Blend is a good source of iodine and trace minerals.	Sassafras	Skin
Kelp	Fights infection	Saw Palmetto	Strengthens the prostate gland
Lobelia	Relaxant and helps headaches	Senna Leaf	Laxative
Marshmallow Root	Bronchitis	Slippery Elm	Sore throats
Milk Thistle	With the liver to protect from undesirable chemicals	Suma	Chronic fatigue
Mulrapuama	Reputed to be an aphrodisiac	Thyme	Migraine headaches
Mullein Leaf	Swollen joints	Uva Ursi	Reduces urinary tract infections
Myrrh Gum	Herbal breath freshener	Valerian	Good for the nervous system; relieves tension, promotes sleep
Nettle	Reduces fever; rich in iron and vitamin C	White Oak	Powerful astringent; kidney and gallstones
Oregon Grape Root	Helps remove toxins from the blood	White Willow	Reduces pain of arthritis and inflamed joints
Osha	Aids immune system; good for smokers	Wild Yam	Cramps
Papaya Leaf	Aids digestion; reduces heartburn	Wood Betony	Heartburn; beneficial to the liver
Passion Flower	Natural tranquilizer; relieves muscle tension	Yellow Dock	Good iron source; builds strength and stamina
Pau D'Arco	Natural tranquilizer; relieves muscle tension	Yerba Mansa	Herbal antibiotic
Peach Leaf	Coughs	Yerba Santa	Chest congestion
Peppermint Leaf	Reduces nausea and relaxes the stomach	Yucca Root	Strengthens the immune system
Psyllium Husk	Nature's colon cleanser to remove toxins from the intestines		
Red Clover	Blood purifier		
Rosehips	Infection fighter; provides natural vitamin C		
Safflower	Good laxative		

Joint Commission on the Accreditation of Healthcare Organizations (JCAHO)

JCAHO requires that all clients receive education on the drug-nutrient interactions and that this education is documented in the client's medical record. This is true across the continuum of care including home care, long-term care, subacute care, and acute care.

The RD should be part of the interdisciplinary team to determine which medications will be addressed in client education. Furthermore, the RD should be instrumental in developing or selecting the materials that are

used for education. A sample educational tool is provided in *Box 2*. However, the RD/DTR does not need to complete the client instruction on drug-nutrient interactions. It is often more efficient for nursing or pharmacy personnel to complete client education upon discharge since these departments are often providing discharge counseling for other issues. This type of team effort meets the interdisciplinary vision of JCAHO standards and improves the quality of client care.

BOX 2:

Drug-Food and Drug-Nutrient Interactions Patient Education Materials

Drug-Food and Drug-Nutrient Interactions Patient Education Materials

General Information

Go to the same pharmacy for all your medicines whenever possible. Tell the pharmacist if you have any allergies or intolerances to foods or drugs and if you are pregnant or nursing a baby.

Always ask your pharmacist:

- Should I take this medicine before, after, or with meals?
- Are there any foods I should avoid while taking this medicine?
- Are there any prescription or over-the-counter medicines or vitamin or mineral supplements I should avoid while taking this medicine?

- Is it OK to drink alcohol while taking this medicine?
- Does this medicine have any common side effects?
- What should I do if I miss a dose?

Do not stop taking your medicine without checking with your doctor or pharmacist, even if you feel better. Contact your pharmacist or doctor if you have any problems or questions about your medicine.

Dietitian Name:

Phone Number:



BOX 2:**Drug-Food and Drug-Nutrient Interactions
Patient Education Materials**

**Important Food and Nutrition Information
When You Are Taking
LOOP DIURETICS
(e.g., Furosemide (Lasix), Bumetanide (Bumex), or
Ethacrynic acid [Edecrin])**

This medicine has been given to you to prevent fluid retention (edema) or to treat your high blood pressure.

- Take this medicine with a *light* meal or with milk.
- Do not drink too much liquid while taking this medicine. Ask your doctor or nurse how much liquid you may drink each day.
- Loop diuretics can cause lack of potassium. Eat some high-potassium foods every day *unless your doctor has told you not to*. Such foods include:

bananas	pineapple
broccoli	potatoes
cantaloupe	raisins
grapefruit or grapefruit juice	tomatoes
milk	watermelon
oranges or orange juice	

- Do not eat too much salt and salty foods. Your doctor may refer you to a registered dietitian (RD) for more information. Here are some tips to help you eat less salt:
 - Cook plain rice, potatoes, and noodles, rather than packaged mixes.
 - Use fresh or plain frozen vegetables, rather than canned vegetables or pickles.
 - Buy low-sodium soups and salad dressings or make your own.
 - Eat plain beef, pork, chicken, and turkey, rather than ham, bacon, sausage, lunchmeat, canned meat, and canned fish.
 - Use herbs and spices such as garlic powder, dried onion, or parsley flakes instead of salt or soy sauce.
 - Choose unsalted pretzels, popcorn, chips, nuts, and other snack foods.
 - Do not drink softened water.
- Do not drink alcohol while you are taking this medicine.

This handout may be duplicated for patient education.



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SOURCES OF INFORMATION FOR ALTERNATIVE THERAPIES

- Academy for Guided Imagery
PO Box 2070
Mill Valley, CA 94942
800/726-2070
www.healthy.net/agi
- American Academy of Medical Acupuncture
582 Wilshire Boulevard, Suite 500
Los Angeles, CA 90036
800/521-2262
- American Art Therapy Association
1202 Allanson Road
Mundelein, IL 60060
847/949-6064
www.arttherapy.org
- American Association for Naturopathic Physicians
2366 Eastlake Avenue, Suite 322
Seattle, WA 98102
206/323-7610
- American Association of Oriental Medicine
433 Front Street
Catasauqua, PA 18032
610/433-2448
www.aaorn.org
- American Botanical Council
PO Box 201660
Austin, TX 78720
512/331-8868
www.herbalgram.org
- American Chiropractic Association
1701 Clarendon Boulevard
Arlington, VA 22209
703/276-8800
www.americhiro.org
- American Herbalists Guild
PO Box 1683
Soquel, CA 95073
- American Massage Therapy Association
820 Davis Street, Suite 100
Evanston, IL 60201
708/761-2602
www.amtamassage.org
- American Music Therapy Association
8455 Colesville Road, Suite 1000
Silver Springs, MD 20910
301/589-3300
www.musictherapy.org
- Association for Applied Psychotherapy and Biofeedback
10200 West 44th Ave
Wheat Ridge CO 80033
(303) 422-8436
www.aaph.org
- Ayurvedic Institute
11311 Menaul NE, Suite A
Albuquerque, NM 87112
505/291-9698
www.ayurveda.com

Center for Mind/Body Studies
5225 Connecticut Avenue, Suite 414
Washington, DC 20015
202/966-7338
www.healthy.net/crnbrn

College of Mahariahi Ayur-Veda Health Center
PO Box 282
Fairfield, IA 52556
515/472-5866
www.theraj.com

Food and Drug Administration
5800 Fishers Lane
Rockville, MD 20857
800/332-0178

Herb Research Foundation
1007 Pearl Street, Suite 200
Boulder, CO 80302
303/449-2265
www.herbs.org

Institute for Noetic Sciences
475 Gate Five Road, Suite 300
Sausalito, CA 94965
415/331-5650
www.noetic.org

The Interfaith Health Program
The Carter Center
One Copenhill
Atlanta, GA 31307
404/614-3757
www.ihpnet.org

International Association of Yoga Therapists
20 Sunnyside Avenue, Suite A243
Mill Valley, CA 94941
415/866-1147

Med Watch
800/332-1088
www.vm.cfsan.fde.gov

National Association for Holistic Aromatherapy
PO Box 17622
Boulder, CO 80308-0622
800/566-6735

National Certification Commission for Acupuncture and
Oriental Medicine
PO Box 97075
Washington, DC 20090
202/232-1404
www.nccaom.org

Nurse Healers Professional Associates
1211 Locust Street
Philadelphia, PA 19017
215/545-8079

Office of Alternative Medicine (NIH)
Box 8218
Silver Springs, MD 20907
301/495-4957
www.altmed.od.nih.gov

Office of Alternative Medicine (NIH)
9000 Rockville Pike, Mailstop 2182
Building 31, Room 5B-38
Bethesda, MD 20892
800/531-1794

Nutrition Considerations in Renal Disease

The leading causes of renal disease include long-term uncontrolled hypertension and diabetic nephropathy. Other causes include polycystic kidney disease, acute insult to the kidney, lupus, and drug-induced kidney failure. Whatever the cause, the nutrition effects are adverse, and nutrition intervention is imperative to improve outcomes.

The primary functions of the kidneys include excretion of urea and other metabolic wastes, maintaining acid-base balance, various hormonal functions, and vitamin D metabolism. It is not surprising, therefore, that loss of normal renal function leads to profound alterations in metabolic processes. These alterations in metabolism, in turn, have a negative impact on nutritional status.

It is well documented that there is a high incidence of malnutrition in clients with renal failure.^{1,3} This is particularly true in the older adult and those with other chronic medical conditions.⁴

As renal disease progresses, medical nutrition therapy (MNT) for these clients becomes more complicated and malnutrition more difficult to correct. It is obviously preferable to prevent the development of nutritional deficiencies through early intervention and close monitoring of nutritional status.

As renal failure approaches “end stage,” some form of renal replacement therapy (RRT) such as dialysis or transplantation may be initiated as a life-sustaining measure. Unfortunately, “renal replacement” is a misnomer, as there are several aspects of normal renal function that are not entirely corrected and further adjustments through medical therapy are often necessary. This again results in changing nutritional requirements and an adjustment in MNT.

Nutritional recommendations for clients at all stages of renal disease must be individualized. As a

client transitions from one level of care to another, MNT must be revised to meet these changing needs. Nutrition recommendations change depending on the diagnosis, other influencing medical conditions, and the severity of the disease.

Nutrition guidelines for the various stages of renal disease have been approved by the Renal Practice Group of The American Dietetic Association and the Council of Renal Nutritionists of the National Kidney Foundation. There are numerous excellent references which give in-depth guidelines for renal nutrition practices.⁵⁻⁷

Included in *The ADA National Renal Diet: Professional Guide*⁶ is a table which gives guidelines for nutrition recommendations for clients with renal disease (predialysis, hemodialysis (HD), and peritoneal dialysis (PD)).

The guidelines presented in *Table 1* are a starting point for the nutrition care of clients with renal disease. These then need to be individualized for each client. Multiple concerns and issues which should be considered for

different stages of renal disease follow.

NUTRITION RISKS IN RENAL DISEASE

The primary nutrition risks which must be addressed in chronic renal failure (CRF) and in end-stage renal disease (ESRD) include calorie-protein malnutrition, hypertension, renal osteodystrophy, and anemia of CRF. These risks may be present in clients who are predialysis, on hemodialysis, or on peritoneal dialysis. A brief summary of each of these risks follows.

Calorie-Protein Malnutrition

Protein and calorie malnutrition is common in clients with renal failure, leading to an increased risk of mor-

Factors in Renal Failure that Predispose Clients to Malnutrition

- Effects of uremia
- Poor appetite
- Nausea
- Vomiting
- Drug/nutrient interactions
- Effects of multiple medications
- Metabolic alterations
- Numerous psychosocial issues

TABLE 1: GENERAL DIET RECOMMENDATIONS FOR RENAL PATIENTS*

Treatment	Pre-ESRD	Hemodialysis	Peritoneal Dialysis
Protein (g/kg IBW)	0.6-0.8**	1.1-1.4	1.2-1.5
Nephrotic Syndrome	0.8-1.0		
Energy (kcal/kg IBW) [†]	35-40	30-35	25-35
Phosphorus (mg/kg IBW)	8-12 ^{††}	< 17 [§]	< 17 [§]
Sodium (mg/day)	1,000-3,000 if necessary	2,000-3,000	2,000-4,000
Potassium (mg/kg IBW)	Typically unrestricted	approximately 40	Typically unrestricted
Fluid (mL/day)	Typically unrestricted	500-750 + daily urine output or 1,000 if anuric	2,000+
Calcium (mg/day)	1,200-1,600	Depends on serum level	Depends on serum level

* See specific guidelines for each treatment modality.

** The upper end of this range is preferred for diabetic and malnourished patients.

[†] See guidelines for estimating energy needs based on weight and activity level.

^{††} Whereas 5 to 10 mg/kg IBW is frequently cited in the scientific literature, 5 mg/kg IBW is practical only when used in conjunction with a very low protein diet supplemented with amino acids or ketoacid analogs.

[§] A diet that is higher in protein may make it impossible to meet the optimum phosphorus prescription.

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bidity and mortality. A multitude of factors contribute to malnutrition in this population.

These risk factors for malnutrition provide the basis for initial nutrition intervention as clients experience profound weight loss and albumin levels drop. Each disease state poses different nutrition obstacles and requirements. Nutrition interventions to correct malnutrition may include liberalization of the diet, use of dietary supplements, use of gastrointestinal (GI) medications, client assistance with meals (ie, meals on wheels, home care services, etc), and others. The clinician must ensure that protein and calorie needs are met. Close monitoring of these clients by the use of food intake records, weight records, assessment of labs, and early medical nutrition intervention will result in better outcomes.

A daily multivitamin supplement is often recommended for predialysis clients. Clients on dialysis lose vitamins through the dialysis process, so a vitamin

specifically to replace the losses is recommended.⁸ Nephrocaps® and Nephrovite® are two commonly prescribed vitamins. These formulations include increased levels of B vitamins and folate, a combination that replaces what is lost through dialysis.

Hypertension

Hypertension is common among clients with CRF. Limiting sodium as shown in *Table 1* is frequently recommended. Clients on hemodialysis should limit sodium intake to 2 g to 3 g daily. Peritoneal clients may liberalize the sodium restriction to approximately 4 g per day.

Renal Osteodystrophy

Clients with kidney disease at all stages are at risk for renal osteodystrophy, or weak brittle bones.⁹ In healthy individuals, kidneys play a role in calcium and phospho-

rus balance by initially activating vitamin D in the kidneys. Vitamin D, in turn, aids in calcium absorption. As kidney function decreases, the body loses its ability to activate vitamin D and serum calcium levels start to drop. This drop in serum calcium triggers parathyroid hormone (PTH) to be released. PTH then triggers a response which allows calcium to be drawn out of the bones to supply serum calcium. Over time, this process results in weakened bones or renal osteodystrophy.

Prevention of renal osteodystrophy is most important because once the condition has occurred, correction is nearly impossible. Calcium supplements should be started if the serum calcium decreases below 9 mg/dL. Over-the-counter (OTC) supplements such as Tums® or other forms of calcium carbonate can be given. A daily dose of 500 mg to 2,000 mg is commonly prescribed. Serum calcium levels should be routinely assessed (monthly, initially) to ensure that the calcium level is within the normal range. Calcium supplements should be adjusted until the serum levels are maintained in the range of 9 mg to 11 mg/dL. (Calcium-rich foods are not recommended to replace low-calcium stores as these foods are high in phosphorus.)

Because calcium is bound to protein, calcium levels may appear falsely low if a client presents with a low albumin. If the albumin level is less than 3.5 mg/dL, an ionized calcium should be drawn to determine a more accurate calcium level. Another way to assess the calcium level is to calculate a "corrected calcium." (Although this is not as accurate as an ionized calcium, it is a good indicator of the approximate calcium level.)

The formula to determine "corrected calcium" follows. Only the serum albumin and actual calcium levels are required to calculate the estimated or corrected calcium.

Example: If a client has a calcium of 8.8 and an albumin of 3.1, the calculations would be:

4 - albumin level	=	x
x times 0.8	=	y
y + actual calcium	=	corrected calcium

$$\begin{aligned}
 4 - 3.1 &= 0.9 \\
 0.9 \times 0.8 &= .72 \\
 .72 + 8.8 &= \text{corrected calcium of } 9.52
 \end{aligned}$$

Multiple Factors Contributing to Calorie/Protein Malnutrition

- Symptoms of uremia (poor appetite, nausea, vomiting)
- GI disturbances (gastroparesis, gastritis, constipation, etc)
- Weight loss
- Multiple medication and food/drug interactions
- Hormonal disturbances (anemia, insulin resistance, etc)
- Comorbid factors (cardiac cachexia, congestive heart failure, uncontrolled diabetes, etc)
- Psychosocial issues (depression, financial problems, loss of job, etc)
- Recurrent hospitalizations

An elevated serum phosphorus is another risk factor for renal osteodystrophy. A low phosphorus diet should be initiated if the phosphorus level is greater than 5.5 mg/dL. A typical diet prescription is 1,000 mg to 1,200 mg daily. This limits foods such as milk products, whole grains, nuts and legumes, colas, and chocolate.

If diet alone does not bring down the phosphorus level, phosphate binders may be used. These are medications which bind phosphorus from food in the GI tract and then excrete it. Phosphate binders should be taken with meals and snacks to be most effective.

Some common phosphate binders include Phoslo® and Alucaps®. Phoslo® is a calcium-based product that will supply calcium as well as bind phosphorus. Alucaps® is an aluminum-based binder. Aluminum binders should be used with caution since high levels of aluminum can be toxic. Aluminum levels should be checked at least every 6 months.

Phosphate binders and calcium supplements should not be taken at the same time as iron supplements. These products may bind with the iron, rendering both medications less effective. Caution should also be taken in recommending supplements which contain magnesium compounds. Magnesium normally excreted by the kidneys can build to toxic levels.

Parathyroid hormone levels may be assessed to determine if a client is in an active stage of renal osteodystrophy. Elevated PTH levels indicate calcium is being drawn from bone to supply blood calcium. To correct the imbalance, calcium supplements are prescribed, and if the PTH level is 1½ times normal, vitamin D is commonly started. Two common forms of vitamin D are Rocaltrol® (given orally) and Calcijex® (given through the dialysis machine).

When giving vitamin D (Rocaltrol® or Calcijex®), it is important to monitor the calcium/phosphorus product. This is determined by multiplying the serum calcium level times the serum phosphorus level. If the result is greater than 70, these medications should not be given as this may lead to calcification of soft tissues.

Example:

(calcium) 10.4 mg/dL × (phosphorous) 6.9 mg/dL = 71.7
Because the result is > 70, vitamin D should NOT be given.

Anemia of Chronic Renal Failure

Clients at all stages of kidney disease are also at risk for anemia of chronic renal failure. Anemia results in symptoms of weakness and shortness of breath. Healthy kid-

neys produce a hormone called recombinant erythropoietin (EPO). This hormone signals the body to make red blood cells. As the kidney loses its ability to make this hormone, hemoglobin and hematocrit levels start to drop and anemia develops. To correct anemia, a synthetic form of EPO may be given either by injection or through the dialysis machine.¹⁰

When assessing for anemia, iron studies should also be done.¹¹ Adequate iron stores are necessary for EPO to work effectively. Iron studies include ferritin, iron, iron binding capacity, and transferrin saturation. If iron stores are low, oral iron may be given. Common brands include Ferrous Sulfate or Niferex®. Intravenous (IV) iron (Infed®) may be given through the dialysis machine.

ADDITIONAL NUTRITION INTERVENTIONS FOR SPECIFIC STAGES OF RENAL DISEASE

Malnutrition, hypertension, renal osteodystrophy, and anemia are all nutrition risks common to renal clients. However, other considerations must also be made for each specific disease state. A brief summary of these concerns/considerations follows.

Nutrition Considerations for Predialysis Clients

In the initial stages of renal disease, blood chemistries become altered as the blood urea nitrogen (BUN) and creatinine levels start to rise. As the disease progresses and as waste products accumulate in the bloodstream, symptoms of uremia develop. These symptoms include altered taste of food, poor appetite, nausea, vomiting, and weight loss. As other metabolic systems are altered, the client may also become weak, tired, and short of breath.

A national study, Modification of Diet in Renal Disease (MDRD), was conducted to determine if MNT would be beneficial in slowing the progression of renal disease.¹² Results suggest that controlling hypertension and moderate protein restriction in the diet may also slow the effects of the disease; however, additional research is necessary. MNT should be initiated when labs or symptoms indicate abnormalities. A client may become symptomatic when the BUN reaches 50 mg/dL or more and the creatinine 3 mg/dL or more, thus requiring intervention. The best indicator of renal function is the urinary creatinine clearance. (If this level is not available, you may calculate an estimated creatinine clearance.) From the creatinine clearance or the estimated creatinine clearance, the dietary protein restriction can be estimated. (See *Table 2*.)

TABLE 2: PROTEIN DETERMINATION FOR CONSERVATIVE MANAGEMENT OF RENAL PATIENTS

Creatinine Clearance or GFR (mL/min)	Suggested g protein/kg ideal weight
5 - 10	0.6
10 - 15	< 0.7-0.8
15 - 20	< 1.0
20 - 30	< 1.3

Sources:

Alpers R. *Manual of Medical Therapeutics*. Boston: Little, Brown & Co; 1983:345.

Kopple ID. Nutritional management of chronic renal failure. *Post Grad Med*. 1971;64:135.

It is important in the early stages of kidney disease to liberalize the diet as much as possible to prevent calorie/protein malnutrition. See *Table 1* for recommendations.

Formula to determine estimated creatinine clearance¹³

$$\text{Men: } \frac{\text{wt (kg)} \times (140 - \text{age})}{72 \times \text{serum creatinine (mg/dL)}}$$

$$\text{Women: } \frac{\text{wt (kg)} \times (140 - \text{age}) \times 0.85}{72 \times \text{serum creatinine (mg/dL)}}$$

Dialysis

As the creatinine clearance approaches 10 mL/min and as symptoms of uremia become uncontrollable with diet and medication, hemodialysis or peritoneal dialysis must be implemented as a life-sustaining measure.

Diets for clients on hemodialysis are more restrictive than diets for clients on peritoneal dialysis. This is primarily because hemodialysis clients average treatment times of 3 to 4 hours, 3 days a week for a total therapy time of 9 to 12 hours per week. Peritoneal dialysis clients average 10 to 12 hours of therapy daily for a total therapy time of 70 to 84 hours per week. Given this time discrepancy, it is logical to assume that peritoneal clients receive “more dialysis” — that is, dietary restrictions are less. Adequate dialysis is a major factor in nutritional status of clients as poor dialysis leads to uremia.¹⁴ Dialysis centers routinely assess adequacy of dialysis.

Hemodialysis (HD)

It is well documented that up to 50% of HD clients are malnourished.² These clients have the same risks as pre-

dialysis clients but also have additional risks which affect oral intake and nutrition needs. Inadequate dialysis and dialysis access problems (clotted grafts, recirculation of grafts, etc.) may affect oral intake as poor dialysis results again in uremic symptoms. It is also estimated that there is a protein loss of 8 g to 12 g with each dialysis treatment. This increases the protein requirement for clients on dialysis.

HD clients are at risk of developing hyperkalemia (elevated potassium levels) as the dialysis machines are unable to remove larger quantities of potassium. High or low potassium levels are dangerous and can lead to cardiac arrest. High potassium foods must be restricted in the diet to control potassium levels in the blood. Most clients can tolerate one or two high potassium foods a day. Only if eaten in excess do problems occur routinely. Examples of high potassium foods include bananas, oranges, melons, potatoes, and tomatoes.

HD clients are at risk for renal osteodystrophy as previously discussed. Controlling dietary phosphorous is important. Other interventions to reduce the risk of renal osteodystrophy include addition of calcium supplements, use of phosphate binders, and oral or IV vitamin D to reduce this risk.

HD clients are at risk for anemia as also previously discussed. Therapy includes iron supplementation and EPO.

A sodium restriction of approximately 2 g to 3 g per day is recommended for clients on hemodialysis.

The most difficult dietary restriction for HD clients is the fluid restriction. Large fluid gains cannot be managed by the dialysis machines in a 3- to 4-hour session. Fluid buildup results in pulmonary edema, peripheral edema, CHF, and symptoms of cramping and low blood pressure while on the machine.

Fluid allowance for a client on HD can be easily calculated. The formula is:

$$750 - 1000 \text{ cc} + \text{urine output volume for 24 hours}$$

For most clients on HD, this results in a fluid restriction of 1,200 cc to 1,500 cc in 24 hours.

Over-restricting of the diet by the client may also occur, so careful monitoring of food records and progress is important.

Peritoneal Dialysis (PD)

PD clients are also at risk for malnutrition.¹⁵ The diet for these clients is usually less restrictive, with the diet order based on blood chemistries. Typically, PD clients do not require a potassium or fluid restriction. PD clients do, however, have a higher protein need as even greater protein loss occurs through the dialysate. Many of these clients have difficulty meeting their protein requirement. Use of supplements, protein powders, etc. to boost protein intake is often beneficial.

PD clients who have diabetes may require an adjustment in the calorie level of their diet or an adjustment of insulin. Because the dialysate is a glucose solution, glucose is absorbed into the body causing a rise in blood sugars. A PD client may typically absorb 300 to 500 calories a day from the dialysate. A formula for calculating glucose absorbed may be found in *A Clinical Guide to Nutrition Care in End-Stage Renal Disease*.⁵

Another nutrition concern of PD clients is hyperlipidemia, especially elevated triglycerides. This is also related to the glucose load from the dialysate. A dietary restriction limiting fats and simple sugars may be beneficial for these clients. A lipid-lowering drug may also be necessary.

PD clients are also at risk for malnutrition, renal osteodystrophy, and anemia as previously discussed. Treatment may need to be implemented for each of these conditions. See *Table 1* for recommendations.

ADDITIONAL CONSIDERATIONS

Extended Care Clients

Whether a client has early kidney disease or is on HD or PD, older clients pose special nutrition issues.¹⁶ A client who is healthy, active, and has a good appetite may need a diet order which encompasses all restrictions. (See *Table 1*.) However, in reality, most older adults have a poor appetite and are experiencing weight loss. For these clients, labs should be reviewed to determine alterations and diets liberalized based on these labs.¹⁷

Use of multiple medications and drug-nutrient interactions can also be factors leading to malnutrition, especially in the older adult.¹⁸ Medications should be reviewed frequently for drug-nutrient interactions.

It is essential that the RD have at least monthly communication with the dialysis center regarding labs, oral intake, client progress on the diet, medication, and condition changes to assist in the ongoing assessment of the client.¹⁹

Nutrition Considerations for Transplant Clients

When a client receives a successful kidney transplant, previous dietary restrictions are lifted. Because steroids are often used for antirejection, appetite is enhanced and a typical client gains 20 or more pounds. Caution to these clients regarding caloric intake is recommended. A sodium-restricted diet may also be implemented, as well as fat restrictions to control calorie intake and reduce risk for coronary artery disease.⁵ Fluids are no longer restricted. See *Table 3* for recommendations.

TABLE 3: NUTRITION RECOMMENDATIONS FOR THE ADULT RENAL TRANSPLANT RECIPIENT

Nutrient	Daily Recommendation	
	Acute Period	Chronic Period
Protein	1.3-2.0 g/kg NBW*	RDA**; limit with chronic rejection
Calories	30-35 kcal/kg NBW or BEE $\times$ 1.3 May increase with postoperative complications	Maintain desirable body weight
Carbohydrate	Limit simple carbohydrate intake if intolerance is apparent.	Emphasize complex carbohydrate intake.
Fat	Remainder of calories Emphasize PUFA and MUFA.*	Emphasize PUFA and MUFA.
Sodium	2-4 g	2-4 g with hypertension
Potassium	2-4 g if hyperkalemic	Unrestricted
Calcium	800-1,500 mg	800-1,500 mg
Phosphorus	RDA** May need supplementation to normalize serum levels	RDA**
Other vitamins	RDA**	RDA**
Other minerals	RDA**	RDA**
Trace elements	RDA**	RDA**
Fluid	Limited only by graft function	Limited only by graft function; generally unrestricted

* NBW, the dry weight when the patient is within normal limits of weight for height, or an adjusted weight if the person is obese; PUFA, polyunsaturated fatty acids; MUFA, monounsaturated fatty acids.

** Due to lack of research, no specific recommendations are available for this population. Currently, the Recommended Dietary Allowance (RDA) is used as a guideline.

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Dialysis Outcomes Quality Initiative (DOQI) Guidelines

The purpose of the DOQI guidelines is to systematically use the accrued knowledge of dialysis and kidney disease to create practice guidelines and educational programs to benefit renal clients.²⁰ The objectives of these guidelines include the following:

- Improved client survival
- Reduced morbidity
- Increased efficiency of care
- Improvement in overall quality of life

Practice guidelines for anemia, hemodialysis adequacy, peritoneal adequacy, and vascular access are completed. These guidelines help the RD continue to upgrade skills in managing medical nutrition therapy for clients with renal disease.

UNDERSTANDING RENAL LABS

“Normal” versus “acceptable” lab values are important to know when treating clients with renal disease. *Box 1* shows normal labs for healthy individuals and acceptable labs for clients with kidney disease.

Comments on Labs

- **BUN:** For hemodialysis and peritoneal dialysis patients, a BUN < 40 indicates poor protein intake. A BUN > 70 may indicate an excessive protein intake or poor dialysis. Predialysis clients may become uremic as BUN approaches 50 or greater.
- **CREATININE:** Creatinine is the waste product of muscle metabolism. A small, 100-pound female would generate less creatinine waste than a 200-pound, muscle-bound male.

BOX 1: *Understanding Renal Labs*

Lab	Normal Range for Healthy Individuals/Predialysis Patients	Acceptable Range for Hemodialysis or Peritoneal Dialysis
Sodium	135 - 145 mEq/L	135 - 145 mEq/L
Potassium	3.5 - 5.5 mEq/L	3.5 - 5.5 mEq/L
BUN	< 28 mg/dl	40 - 70 mg/dL
Creatinine	0.5 - 1.5 mg/dL	5 - 15 mg/dL
Albumin	3.5 or greater g/dL	3.5 or greater g/dL
PTH	varies with test used	1.5 x's normal
Calcium	9 - 11 mg/dL	9 - 11 mg/dL
Phosphorus	2.5 - 4.5 mg/dL	3.5 - 5.5 mg/dL
Cholesterol	< 200 mg/dL	< 200 mg/dL
Triglyceride	< 150 mg/dL	< 150 mg/dL
Glucose	60 - 120 mg/dL	60 - 120 mg/dL
Magnesium	1.5 - 2.9 mg/dL	1.5 - 2.9 mg/dl
Aluminum	0 - 6.0 ng/mL	< 40 ng/mL
Ferritin	25 - 335 ng/mL	100 - 250 ng/mL (on EPO)
Hematocrit	35% - 50%	33% - 36%
Hemoglobin	12 - 17 g/dL	10 - 12 g/dL
Iron	60 - 190 µg/dL	60 - 190 µg/dL
Iron binding	250 - 450 µg/dL	250 - 450 µg/dL
Iron saturation	23% - 44%	over 20%
KT/V		1.2 HD 1.4 (diabetics) 2.0 PD (CAPD) 2.1 PD (CCPD)
PCR		Over 1 g/kg
Average weight gain between dialysis treatments		< 2.5 kg

Creatinine levels may vary from person to person but should remain constant. A rise in creatinine may indicate poor dialysis. Creatinine is not affected by diet.

- **ALBUMIN:** Albumin is the most reliable indicator of nutritional status. A low albumin signals a poorly nourished, high-risk patient. Nutrition intervention is necessary.
- **PTH:** Treatments with calcium and vitamin D should start when PTH levels reach 1½ times normal.

- **FERRITIN:** Ferritin levels must be adequate for EPO to work effectively. (Infections or blood transfusions may falsely elevate ferritin.)
- **KT/V:** KT/V measures adequacy of dialysis treatments. Inadequate dialysis often results in malnutrition.
- **PCR:** PCR measures protein catabolic rate, an indicator if the client is getting enough protein.

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CASE STUDY

A 58-year-old male with a history of poorly controlled non-insulin-dependent diabetes mellitus, alcohol and tobacco abuse, and chronic obstructive pulmonary disease (COPD) is admitted to an extended care facility. He has a recent history of poor intake and 22-pound weight loss over the past 4 months. Complications of his disease include chronic renal failure as well as retinopathy and peripheral vascular disease. He is 70 inches tall and weighs 148 pounds. His labs on admission include the following:

Albumin: 3.3	BUN: 48	Creatinine: 4.6
K: 4.5	Phos.: 4.3	

His physician orders a 1,800 kcal diabetic diet with 50 g protein, 2 g Na, 2 g potassium.

Is this diet appropriate?

Most likely this diet order would unnecessarily restrict food choices. It also may provide inadequate protein in an individual who has marginal nutritional status. While there may be some evidence that protein restriction may delay the progression of renal failure, the risks of such therapy in an already protein-depleted client may outweigh any short-term benefits. As potassium levels are within normal limits, there is no need for dietary potassium restriction at this point. Due to his weight loss and chronic conditions with potential impact on nutritional status, a liberal geriatric diet with limited concentrated sweets may be more appropriate.

What other lab tests would you suggest?

It would be beneficial to begin to monitor iron status, as there are risk factors for iron deficiency present. It would also be helpful to monitor calcium levels and to calculate the urinary creatinine clearance in order to assist in estimating residual renal function. Because the client has a history of diabetes, blood glucose monitoring should be initiated.

How would you monitor the client's nutritional status?

Frequent weight measurements would be helpful as well as physical assessments for evidence of edema. Monthly albumin levels may also be helpful if available but probably would add no other information not readily determined from the assessment of trends in physical assessment, intake, and weight. In some individuals with chronic inadequate energy and protein intake, albumin levels may be maintained at normal or near normal levels for quite some time. Additional laboratory indices to monitor include BUN, creatinine, potassium, calcium, phosphorus, iron status, and creatinine clearance.

Over the course of 2 months, the client's oral intake decreases. The physician orders a low protein, low electrolyte supplement to be given three to four times each day. His labs include the following:

BUN: 48	Creatinine: 5.8
K: 4.6	P: 4.8

What would you suggest?

These lab values indicate the presence of protein malnutrition as evidenced by the stable BUN level in the face of a rising creatinine. At this level of renal failure, adequate protein intake would lead to a significant increase in BUN. Therefore, supplemental protein should be given, up to approximately 0.8 g/kg. Energy and protein intake should be maximized by offering favorite foods and increasing the caloric content of foods eaten by addition of sauces, butter, etc. Again, there is no evidence of a need for electrolyte restriction.

Two months later, dialysis therapy is initiated.

Would you change the client's diet?

The initiation of dialysis therapy may improve appetite and intake in this individual due to resolution of uremic symptoms. While monitoring for excessive intake of potassium and phosphorus, there still appears to be no need for severe restrictions, although the potential for hyperkalemia and hyperphosphatemia is now significantly increased. Most likely, the liberal geriatric diet with limited concentrated carbohydrate and moderate fluid restriction would be appropriate. If potassium and phosphorus levels increase, then restriction of these minerals to approximately 2.0 g to 2.5 g potassium and 800 to 1,000 mg phosphorus may be appropriate. Regular communication with the dialysis unit is necessary in order to appropriately monitor intake as well as nutritional status.

Enteral and Parenteral Nutrition Support

Enteral and parenteral nutrition support are therapies used to provide nutrients for maintenance or restoration of nutritional status in medical conditions where nonvolitional feeding is necessary. These forms of nutrition support have become commonplace with recent technological advances and developments of specialized formulas.

A rapidly growing segment of the United States population is the older adult, or persons older than 65 years of age. Currently, persons over the age of 65 comprise 12% of the U.S. population with an expected increase to 22% by the year 2030.¹ With this demographic change there is also an expected increase in the number of older adults who will spend time in an extended care facility. This group is likely to suffer from malnutrition.

The incidence of malnutrition in the hospitalized or extended care client is approximately 30% to 50%.²⁻⁴ Its impact is significant, affecting mortality, morbidity, and length of stay.⁴⁻⁶ The risk of malnutrition is increased in the older adult and the identification of risk factors associated with malnutrition in the older adult is important to the design of nutrition support. Common risk factors include history of chronic disease, chronic infections, multiple medications, difficulty chewing and swallowing, and poor functional status.⁷

The role of the RD includes the identification of nutrition support candidates, nutrition assessment, and design, implementation, and monitoring of nutrition support as well as the documentation of client response to nutrition support. (See *Figure 1*.)

ENTERAL NUTRITION SUPPORT

Clients who are unable to meet their nutritional requirements on their own may be candidates for enteral nutrition. Enteral nutrition may be supplemental or provide full nutrition.

Indications for enteral nutrition support:

- At risk or presence of malnutrition
- Adequate intestinal digestion and absorption
- Absence of bowel obstruction
- Able to attain and maintain access
- Adequate tolerance to feeding

Common conditions for which enteral nutrition support is indicated:

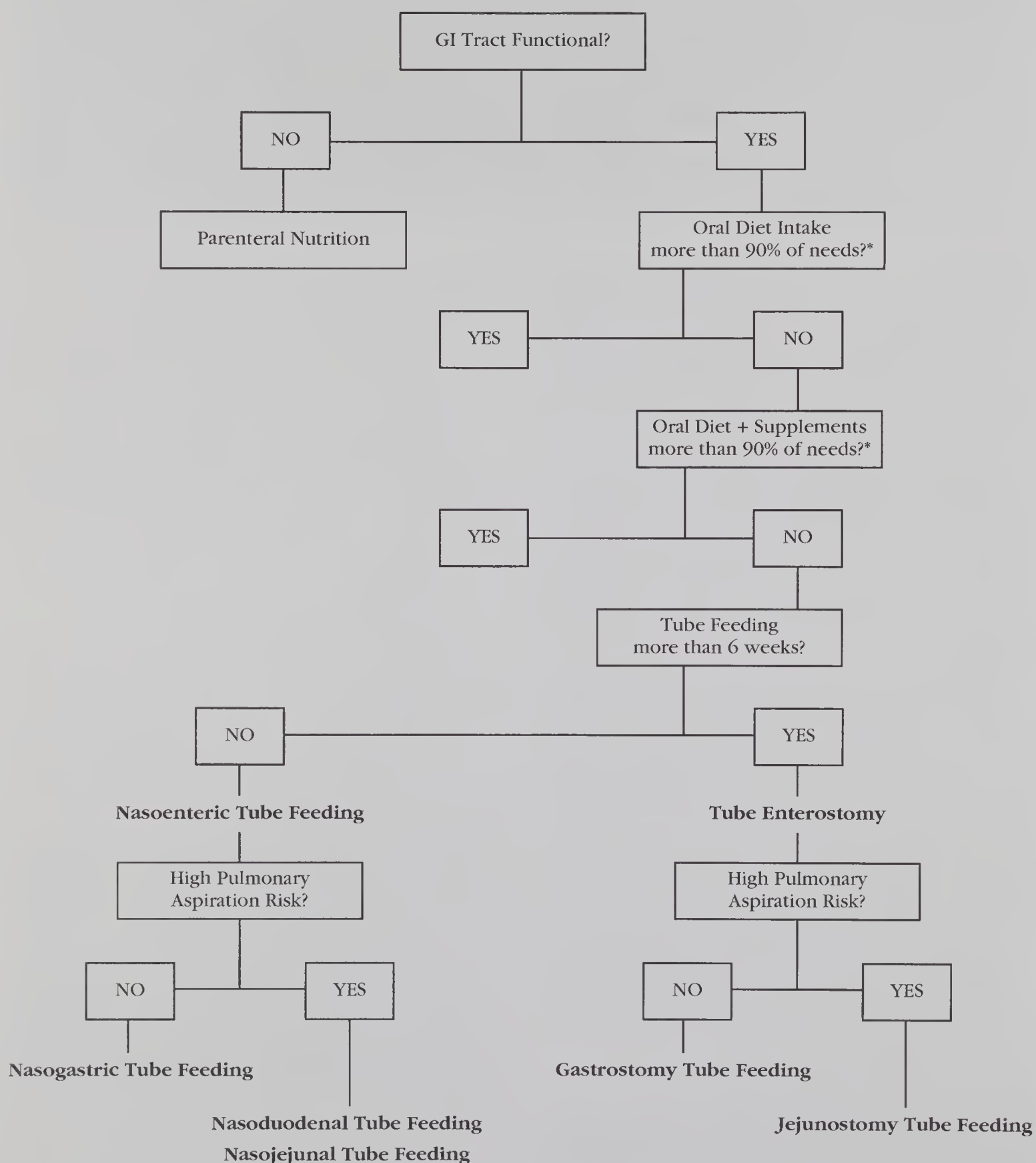
- Cerebral vascular accident (CVA)
- Depression
- Dysphagia
- Respiratory failure
- Cancer
- Comatose
- Cardiac failure
- Gastrointestinal disease

Enteral Feeding Access

Determining the optimal access route for enteral nutrition depends on the anticipated duration of therapy, the adequacy of gastric function, lower esophageal sphincter competence, and the risk of aspiration.

Feeding tubes used for enteral feeding are made of soft, biocompatible materials such as polyurethane or silicone. Most adult clients tolerate a tube diameter of 8 to 10 French with a length of 110 cm for nasogastric or transpyloric placement. (French (Fr.) is the unit commonly used for external tube diameter. 1 Fr. = 3.28 mm.)

Figure 1
Determining the Optimal Feeding Model



* Demonstrated by daily calorie counts.

Source: Reprinted with permission of the Cleveland Clinic Foundation from Ideno KT. Enteral nutrition. In: Gottschlich MM, Matarese LE, Shrouts EP, eds. *Nutrition Support Dietetics Core Curriculum*. 2nd ed. Silver Spring, Md: ASPEN; 1993;83.

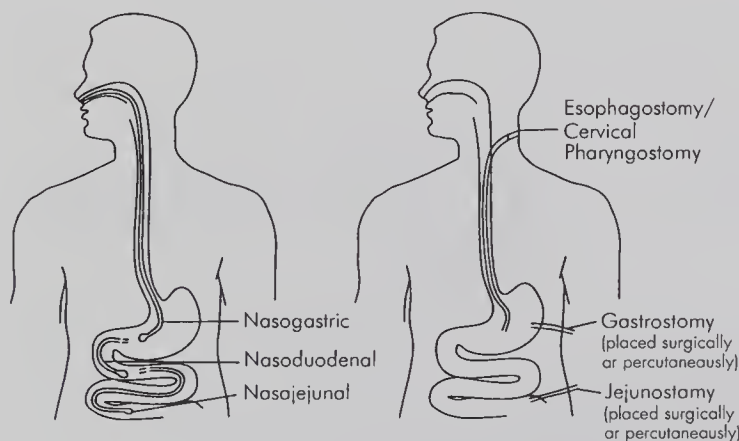
Nasoenteric Feeding Tube Placement

Clients who require enteral nutrition support for a short period of time (ie, less than 6 weeks) may benefit from a nasoenteric feeding tube placed in the stomach, duodenum, or proximal jejunum. (See *Figure 2*.) Clients with gastroparesis, diseases involving the stomach, or those at risk of pulmonary aspiration should have a tube placed beyond the pylorus into the small bowel. Nasoduodenal and nasojejunal feeding tubes may be placed by a variety of methods, including spontaneous passage, in which the tube migrates to the small bowel by peristalsis or with the help of prokinetic agents (eg, metoclopramide, cisapride, erythromycin), active bedside placement such as the Zaloga technique,⁸ or fluoroscopic and endoscopic methods. The type of method used depends on the training of the clinician and availability of equipment.

Methods of Placement of Nasoenteric Tubes

- Active bedside placement such as Zaloga technique
- Fluoroscopic
- Endoscopic

Figure 2
Common Access Sites for Tube Feeding⁹



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Enterostomy Feeding Tube Placement

Clients who require access to the gastrointestinal tract for longer than 6 weeks may have a gastrostomy or jejunostomy tube placed surgically or endoscopically.

A surgical gastrostomy is performed under general anesthesia in the operating room, whereas a percutaneous endoscopic gastrostomy (PEG) may be performed at the bedside or in an endoscopic suite with local anesthesia. Gastrostomy tubes are indicated when gastric emptying is normal, a gag reflex is present, and there is no esophageal reflux.

Jejunostomy feeding tubes are generally placed at the time of a surgical procedure, or they may be placed

endoscopically (percutaneous endoscopic jejunostomy or PEJ). Another method of jejunal feeding tube placement is the insertion of a small feeding tube through a PEG into the jejunum, referred to as a jejunal extension tube or JET-PEG. Due to the technical difficulty of this method, the JET-PEG is not commonly used.

Candidates for jejunal feeding tubes include those at risk of aspiration, severe esophageal reflux, obstruction, stricture, fistulae, or ileus of the upper gastrointestinal tract.

An esophagostomy or cervical pharyngostomy may be performed in patients with head and neck cancer, but these are generally not common sites used for enteral feeding access.

Formula Selection

The several formulas available for enteral nutrition support can be grouped into three main categories: polymeric, predigested, and modular. Selection of formula is based on several factors including digestive and absorptive capacity, volume status, and overall disease state. See *Table 1* for specific guidelines regarding the selection of enteral formulas.

Polymeric Formulas

These formulas are nutritionally complete, predominantly lactose-free, and are casein- or soy protein isolate-based. Normal digestion and absorption are required since nutrients are in an intact molecular form. Polymeric formulas supply all necessary nutrients for complete nutrition, generally in 2 liters or less. Polymeric formulas are available in the following varieties: standard, high-nitrogen, fiber-supplemented, concentrated, and disease-specific (ie, renal, hepatic, glucose intolerance, pulmonary, and stress/trauma).

Predigested Formulas

Minimal or no digestion is required for the absorption of predigested formulas. Generally, the carbohydrate source is glucose oligosaccharides, and protein is provided as short-chain peptides and/or free amino acids. These formulas are usually low in fat and/or provide a portion of the fat in the form of medium-chain triglycerides.

Modular Formulas

Modular components of single macronutrients (ie, carbohydrate, protein, and fat) may be used to alter the caloric or protein content of a base formula or create a new tube feeding formula.

Administration Techniques

The method of administration to provide enteral nutrition support depends on the location of the feeding tube, client tolerance to the feeding regimen, and overall nutrition goals. The three methods of tube feeding (TF) administration are bolus, intermittent, and continuous.

TABLE 1: SELECTION OF TUBE FEEDING FORMULAS

Type	Description	Indications for Use	Advantages	Disadvantages
Standard	• Nutritionally complete • Low residue • Lactose-free • Isotonic • 1.0 kcal/mL • 80%-85% water	• General tube feeding needs • Supplement inadequate oral intake	• Inexpensive • Readily available	• Requires normal digestion and absorption
Fiber-supplemented	• Nutritionally complete • Lactose-free • Fiber source mainly soy polysaccharide • Contains 5 g-14 g fiber/1,000 mL	• Normalize bowel function • Long-term feeding	• Fiber addition well-tolerated	• Adequate water needed to minimize gastrointestinal side effects
High Nitrogen	• Nutritionally complete • Lactose-free • Low residue • Protein >15% total calories	• Increased protein requirements	• Increased protein content without increased caloric level	• Increased renal solute load may increase water requirements
Concentrated	• Nutritionally complete • Lactose-free • Low residue • Osmolality of 450-600 mOsm/kg of water • 70%-80% water	• Fluid restrictions • Limited formula volume tolerance	• Allows provision of energy and nutrient needs in a limited volume of formula • Well tolerated in most patients	• Hypertonic • Lower percentage of water may increase risk of dehydration
Disease-specific	• Specific organ dysfunction and/or hypercatabolism	• Renal failure • Diabetes • Respiratory failure • Stress/trauma • Hepatic failure • AIDS	• Alteration of macro- and micronutrients for clients with specific diseases	• Higher cost • Controversial efficacy
Predigested	• Nutritionally complete • Low residue • Peptide- and/or amino acid-based • Very low fat content (1%-15% of calories) • Osmolality of 450-700 mOsm/kg of water • Low in fat or fat mainly in form of MCT	• Malabsorption • Maldigestion • Transition from total parenteral nutrition (TPN) to enteral nutrition	• Easily digested and absorbed	• Higher cost • Less palatable • Hypertonic

1. A bolus feeding is characterized by the rapid delivery (10 minutes or less) of 300 mL to 400 mL of formula several times a day. Feedings are infused through a tube into the stomach via a syringe. This method is frequently used in home care and is a more physiologic method of providing nutrition. However, bolus feedings are more likely to result in nausea, diarrhea, vomiting, distension, cramps, or aspiration than other administration methods.
2. Intermittent feedings deliver 300 mL to 400 mL of formula over a 20- to 30-minute period several times daily by gravity drip or an infusion pump. Most of the gastrointestinal problems associated with bolus delivery may be eliminated. Both bolus and intermittent feedings may be scheduled for daytime delivery so that the client does not have to be awakened at night.
3. Continuous feedings may be given by gravity drip or an infusion pump. They can be delivered over 24 hours but are usually cycled over a 10- to 12-hour period. Continuous feedings are required when the tube is in the duodenum or jejunum due to the lack of gastric reservoir holding capacity. Continuous feedings are usually the best tolerated form of TF, especially as tube feedings are initiated.

Contamination of any TF system may originate from nonsterile ingredients and equipment and lack of aseptic technique in the preparation of the feeding by the client or caretaker. The risk of contamination may be minimized by proper handwashing, use of aseptic preparation methods, and adherence to TF monitoring techniques in *Table 2*.

TABLE 2: TUBE FEEDING MONITORING

Monitoring Parameter	Frequency for Continuous TF	Frequency for Intermittent TF (includes cyclic and bolus)
Maintain head of bed at 30° minimum.	Continuously and for 30 minutes after TF discontinued	During TF administration and for 30 minutes after TF discontinued
Check gastric residuals (gastric feedings only).	Every 4-8 hours	Before administering TF (every 4-8 hours if feeding longer than 8 hours)
Flush feeding tube with 20-30 mL of water.	- After TF discontinued or interrupted - Before and after any medication infused via feeding tube - Every 4-8 hours	- After TF discontinued or interrupted - Before and after any medication infused via feeding tube - Before and after each period of TF administration
Change TF delivery container and tubing (excluding feeding tube).	Daily	Daily
Flush TF administration container and tubing with water.	- Every 4-8 hours - Before adding fresh formula to empty TF container	After each TF administration period
Refill TF administration container with fresh formula — open system.	- Every 4-8 hours - Limit formula hang time to no more than 8 hours per feeding period.	- Beginning each feeding period - Limit formula hang time to no more than 8 hours per feeding period.
Hang new TF administration container — closed system	Limit formula hang time to no more than 24 hours or according to manufacturer's recommendation.	Limit formula hang time to no more than 24 hours or according to manufacturer's recommendation.

Isotonic feedings have an osmolality range of 280 mOsm to 320 mOsm/kg water, whereas hypertonic feedings exceed this range. Tube feedings can generally be initiated at full strength even with hypertonic formulas when administered at a slow rate.¹⁰ If intolerance develops with a hypertonic formula, it may be changed to half-strength, continuing with the same feeding schedule until the desired rate is achieved, then switched to full strength. Altering the rate and strength at the same time should be avoided. Continuous feedings can be initiated at 20 mL to 50 mL per hour.¹⁰ Advancement may range from 10 mL to 25 mL per hour every 8 to 24 hours until the goal rate is achieved. Transition to a bolus or intermittent schedule is best done after tolerance to continuous feedings is established. *Box 1* is an example of initiation and progression of TF.¹⁰

Medication Administration

The administration of medications through enteral feeding tubes should be avoided if possible due to the risk of tube occlusion and incompatibility of medications with TF formulas. Other routes for medication administration, such as oral, intravenous, or intramuscular, should be used. When medications must be administered through the enteral feeding tube, the following guidelines should be followed.¹¹

1. Flush the feeding tube with 15 mL to 30 mL of warm tap water before and after administering any single medication.
2. If a medication is to be given on an empty stomach, check gastric residuals before administration.
3. Use only water to flush feeding tubes.

4. Medications for enteral feeding tube administration should be provided in the most appropriate solution or suspension. (Check with a pharmacist as needed.)
5. Administer medications as liquid, crushed tablets, or opened capsules diluted in 10 mL to 15 mL of room temperature tap water.
6. Administer each medication separately.
7. Dilute hypertonic medications with water.
8. Administer medications known to cause gastrointestinal (GI) irritation when formula remains in the GI tract.
9. Avoid potential drug-nutrient interactions by using alternative administration routes, alternating formulas or medications, altering feeding or medication schedules as indicated, and multidisciplinary team input.

Monitoring

Appropriate monitoring may prevent or reduce the complications associated with TF. Long-term TF clients should have the following parameters monitored daily: body weight, presence of edema/ascites, fluid intake/output, bowel function, and medications. Clients with diabetes need to have blood glucose levels monitored daily. Other parameters that should be checked on a 6-month basis for stable clients are electrolytes (ie, sodium, potassium, and chloride), blood urea nitrogen, creatinine, phosphorous, calcium, liver function, magnesium, albumin, and transferrin. *Table 2* provides guidelines to help prevent complications of tube feedings.¹⁰

BOX 1: Suggested Timetable for Tube Feeding

Delivery	Rate	Time
Continuous TF	50 mL/hour	First 8 hours
	75 mL/hour	Second 8 hours
	100 mL/hour	Third 8 hours
	Goal	24 hours
Intermittent/Bolus TF	120 mL q 4 hours	First 8 hours
	180 mL q 4 hours	Second 8 hours
	240 mL q 4 hours	Third 8 hours
	Goal	24 hours

Complications

Although generally considered to be safe, TF is not totally free of complications. Problems related to the delivery of TF may be classified into three categories: mechanical, gastrointestinal, and metabolic.

Mechanical

Feeding tube displacement and migration are serious mechanical complications of enteral nutrition and may result in aspiration, diarrhea, or peritonitis (with gastrostomy or jejunostomy tubes). Verification of tube placement by x-ray needs to be done before feedings are started or any time tube malposition is suspected.

Formula coagulation, obstruction by pill fragments, tube kinking, and precipitation by incompatible medications may lead to feeding tube obstruction. It is preferable to dislodge the obstruction rather than replace the tube.¹² See the Medication Administration section of this chapter for guidelines regarding the delivery of medications via feeding tubes.

Nasoenteric tubes are associated with pressure necrosis, which may also lead to sinusitis, mucosal ulceration, abscess formation, and perforation. The risk of pressure necrosis can be minimized by the use of small-bore soft-feeding tubes or by replacing nasoenteric tubes with gastrostomy/jejunostomy tubes for long-term nutrition.

Leakage of feeding tube contents can be secondary to several different problems. If the leakage is due to an infection, then antibiotic therapy, debridement, and/or feeding tube removal may be indicated. Tube leakage due to stomal enlargement can be treated by decreasing the diameter of the stoma or replacing the tube with a larger one.

Gastrointestinal

These complications may result from the administration of TF. Regurgitation occurs when the feeding formula is not absorbed and accumulates in the gastrointestinal tract. The feeding should be held or decreased while determining the cause of the problem. Aspiration may occur as a complication of regurgitation. This is one of the most serious and life-threatening complications of enteral nutrition support.¹³ The risk of aspiration is decreased by elevating the head of the bed, regularly checking gastric residuals, using small-bore feeding tubes, providing feedings via continuous delivery, and placing the feeding tube beyond the pyloric sphincter. It may also be desirable to feed transpylorically while decompressing the stomach.

One of the most common complications associated with TF is diarrhea, occurring in up to 30% of all tube feeding clients.¹⁴ However, it is not usually a result of the tube feeding itself, but can be caused by antibiotic therapy, hypoalbuminemia, osmotically

active medications, and microbial contamination of the feeding product.

Metabolic

Dehydration, hypernatremia, and azotemia may occur in an unconscious or debilitated client who is unable to communicate or alleviate thirst. These complications may be reduced by the delivery of adequate amounts of water, especially to clients who are febrile or who have additional fluid losses from ostomies, fistulas, and/or drains. Overhydration may also occur if a client is receiving excessive amounts of fluid. Accurate daily assessment of fluid intake/output is needed to help minimize these complications.

Refeeding is a potential complication of TF delivery in the severely malnourished client. This occurs as carbohydrate is provided since the major source of energy and insulin release is stimulated. As a result, potassium, magnesium, and phosphorous move intracellularly. Electrolyte abnormalities created by refeeding may result in cardiac dysfunction, excess sodium and water retention, and death from respiratory or cardiac failure. The risk of refeeding can be minimized by taking several days to reach nutritional goals in severely malnourished patients.

PARENTERAL NUTRITION SUPPORT

Parenteral nutrition (PN) is the provision of macronutrients, vitamins, minerals, and electrolytes via a central or peripheral vein. The route of administration depends on the length of anticipated therapy, nutritional requirements, available intravenous (IV) access, and fluid status.

Indications for Parenteral Nutrition Support

- Nonfunctioning GI tract:
 - Severe malabsorption
 - Short-bowel syndrome
 - Obstruction
 - Intractable diarrhea or vomiting
 - Gastrointestinal bleed
 - Radiation enteritis
 - Bowel ischemia
 - High output fistula (> 200 cc)
- Bowel rest (eg, severe pancreatitis)
- GI tract nonaccessible or safe for enteral nutrition support

Intravenous Access

Intravenous access may be categorized as peripheral or central and either temporary or permanent. Peripheral catheters need to be changed every few days and therefore are not used for long-term PN.

Central access devices for total parenteral nutrition (TPN) include the following:

- Temporary central catheters which do not require surgery may be inserted at the bedside and are generally used in the hospital only.
- Permanent catheters (ie, Hickman®, Broviac®, Groshong®) which are inserted surgically are tunneled subcutaneously and have an exit site on the chest wall.
- Implantable devices (ie, Mediport®, Port-a-cath®) which are also inserted surgically are completely under the skin and are accessed using a special needle.

Peripherally inserted central catheters (PICCs) are another type of IV access device that have also been used for TPN.

Regular and meticulous care of central catheters is imperative to prevent catheter-related problems such as infection or sepsis. Catheter care protocols must be in place in any institution where catheters are used for nutrition support.

Components of Parenteral Nutrition Solutions

Macronutrients

The macronutrients used in PN solutions are dextrose, amino acids, and lipids. (See *Table 3*.) Requirements are based on the clinical and nutritional status of the client. Dextrose is the primary source of calories because it is relatively inexpensive and generally well tolerated. Dextrose provides 3.4 kcals/g and is available in concentrations ranging from 5% to 70%. Amino acids provide 4.0 kcals/g and are available in concentrations ranging from 3% to 15% as standard solutions or disease-specific formulas for patients with renal or liver failure. The disease-specific formulas are generally designed for short-term use in an acute care setting and are rarely indicated in long-term PN. Lipids provide 9.0 kcals/g and are available in 10%, 20%, or 30% concentrations. Lipids provide essential fatty acids (EFAs) in addition to being a source of calories. Requirements for EFAs can be met by admixing lipids in the PN solution or by infusing 500 mL of 20% fat emulsion once per week or 250 mL of 20% fat emulsion three times per week separately.

TABLE 3: MACRONUTRIENTS IN PN SOLUTIONS

	Concentration	grams/L	kcals/L
Dextrose	5%	50	170
	10%	100	340
	20%	200	680
	50%	500	1,700
	70%	700	2,380
Amino Acids	3.0%	30	120
	7.0%	70	280
	8.5%	85	340
	10.0%	100	400
	15.0%	150	600
Lipids	10%	122	1,100
	20%	222	2,000
	30%	333	3,000

Micronutrients

Electrolytes need to be added daily to the PN solution. Requirements vary among individuals based on clinical status, renal function, and medications. (See *Table 4*.) Electrolytes are commercially available as single or multiple additives and can be added as needed to the PN solution except in the case of calcium and phosphorus. Excessive concentrations of calcium and phosphorus can result in the formation of a precipitate which can be life-threatening if the solution is infused. Consult a pharmacist for guidelines.

TABLE 4: AVERAGE DAILY ELECTROLYTE REQUIREMENTS DURING TOTAL PARENTERAL NUTRITION¹⁵

Sodium	80-100 mEq
Potassium	80-100 mEq
Chloride	80-100 mEq
Calcium	15-20 mEq (0.2-0.3 mEq/kg/day)
Magnesium	15-25 mEq (0.25-0.35 mEq/kg/day)
Phosphate	20-30 mM (7-9 mM/1,000 kcal)

From Grant JP, *Handbook of Total Parenteral Nutrition*. Philadelphia, Penn: W B Saunders; 1992;180. Reprinted with permission from the Cleveland Clinic Foundation.

Vitamins and trace elements are essential for normal cellular function and should be added to the PN solution daily. Intravenous requirements for vitamins and trace elements were established by the Nutrition Advisory Group of the American Medical Association. (See *Table 5*.) Since the original recommendations, there has also been evidence to support the addition of selenium.¹⁶ Requirements can be met by the addition of 50 mcg to 120 mcg selenium daily. It is important to be aware of the content of commercially available multivitamin and trace element preparations. Most multivitamin preparations do not contain vitamin K due to potential interference with anticoagulation therapy. Clients on long-term PN who do not require anticoagulation should be given 5 mg vitamin K once per week in their solution. Trace element preparations contain anywhere from four to six components. Vitamins and trace elements can be ordered as single additives if needed.

Medications

The use of PN as a method for administering medications is generally not recommended due to potential incompatibility among the drug and other components of the solution, the inability to adjust or discontinue the dose without discontinuing the solution, and the necessity to infuse medications continuously rather than intermittently. Potential advantages of using PN solutions to deliver medications include cost savings due to decreased use of materials and labor, fluid savings due

to a decrease in the number of IVs, and a lower risk of contamination due to less manipulation of the IV lines. Medications routinely added to PN solutions include heparin to prevent catheter occlusion, insulin to control blood sugars, and H2 blockers (eg, famotidine) to prevent gastric ulcer formation. Other medications that have been added to PN include antibiotics, aminophylline, metoclopramide, octreotide, and steroids. A pharmacist should be consulted before adding any medication to a PN solution.

Administering Parenteral Nutrition

Formula Selection

Parenteral nutrition solutions are usually categorized as either central or peripheral and either 2-in-1 (ie, dextrose + protein) or 3-in-1 (ie, dextrose + protein + lipids). The type of formula is determined by the clinical and nutritional status of the client along with the type of IV access. Peripheral parenteral nutrition (PPN) requires a formula that is modest in osmolality to prevent thrombophlebitis. Lipids are the primary source of calories in PPN since dextrose, amino acids, and electrolytes contribute to osmolality. Solutions with a final dextrose concentration of less than 10% and an osmolality below 900 mOsm/kg are generally well tolerated by peripheral veins.

TABLE 5: PARENTERAL VITAMIN AND TRACE ELEMENT REQUIREMENTS FOR ADULTS^{17,18}

Vitamins	A (IU)	3,300
	D (IU)	200
	E (IU)	10
	Ascorbic acid (mg)	100
	Folic acid (µg)	400
	Niacin (mg)	40
	Riboflavin (mg)	3.6
	Thiamin (mg)	3.0
	B-6 (mg)	4.0
	B-12 (µg)	5.0
	Pantothenic acid (mg)	15
Trace Elements	Biotin (µg)	60
	Chromium (µg)	10-15
	Copper (mg)	0.5-1.5
	Manganese (µg)	150-800
	Zinc (mg)*	2.5-4.0

* 2.0 mg for catabolism, 12.2 mg/L for small bowel fluid loss, and 17.1 mg/kg for stool loss

Central TPN solutions are not limited by osmolarity since they are infused through a larger vein and, therefore, can be concentrated as either a 2-in-1 or 3-in-1. Dextrose-based solutions are preferred in clients who can tolerate the carbohydrate load due to concerns with compatibility and immunosuppression associated with IV lipids.¹⁹ With dextrose-based TPN, lipids can be infused one to three times per week to prevent fatty acid deficiency, usually by "piggybacking" into the IV line using a "Y" set. Lipid-based solutions are indicated when minimizing carbohydrate intake is desired.

The stability of 3-in-1 solutions can be disrupted by improper admixing or inappropriate levels of macronutrients causing a separation of the aqueous and lipid portions of the solution. This is referred to as creaming or cracking. If this occurs, the PN solution should not be infused and a pharmacist should be consulted to adjust the level of macronutrients.

Standard PN solutions are available in many institutions and may be appropriate for clients who are medically stable. However, it is important to be able to make appropriate adjustments in the PN formula when necessary, including determining the dextrose, amino acid, and lipid content of solutions. (See *Boxes 2a* and *2b*.)

BOX 2a: Determining PN Prescription

A. Calculate calorie and protein content given final concentrations.

eg, D₂₅ AA_{4.25} L_{3.0} @ 2,400 mL/day

1. Calculate grams of dextrose, amino acids, and lipids using the formula:

(concentration × volume of solution in liters) × 10

eg, (25% dextrose × 2.4L) × 10 = 600 g dextrose

(4.25% amino acids × 2.4L) × 10 = 102 g amino acids

(3.0% lipids × 2.4L) × 10 = 72 g lipids

2. Calculate calories for dextrose, amino acids, and lipids by multiplying grams by kcals/g.

eg, 600 g dextrose × 3.4 kcals/g = 2,040 kcals

102 g amino acids × 4 kcals/g = 408 kcals

72 g lipid × 9 kcals/g = 648 kcals

3. Add calories from dextrose, amino acids, and lipids to determine total calories.

eg, 2,040 + 408 + 648 = 3,096 kcals

B. Calculate calorie and protein content given volume of base solutions.

eg, 357 mL D₇₀, 1,200 mL AA₁₀, 250 mL L₂₀

1. Convert volume of base solutions into liters.

eg, 357 mL D₇₀ = .357 L, 1,200 mL AA₁₀ = 1.2 L, 250 mL L₂₀ = .250 L

2. Multiply volume (L) by kcals/L for base solutions (see *Table 3*).

eg, .357 L D₇₀ × 2,380 kcals/L = 850 kcals

1.2 L AA₁₀ × 400 kcals/L = 480 kcals

.250 L L₂₀ × 2,000 kcals/L = 500 kcals

3. Add calories from base solutions to determine total calories.

eg, 850 + 480 + 500 = 1,830 kcals

4. Multiply volume of amino acid solution (L) by grams/L to determine protein content.

(see *Table 3*).

eg, 1.2 L AA₁₀ × 100 g/L = 120 g amino acids

BOX 2b: Worksheet for Determining PN Prescription***A. Calculate calorie and protein content given final concentrations and volume.**

eg, D₂₅AA_{4.25}L_{3.0} @ 2,400 mL/day

1. Record concentration of dextrose, amino acids, and lipids in solution (below).
2. Calculate grams of dextrose, amino acids, and lipids by multiplying concentration by volume of solution in liters (× 10).

$$\begin{array}{rclcl} \text{_____ \% dextrose} & \times & \text{_____ L} \times 10 & = & \text{_____ g dextrose} \\ \text{_____ \% amino acids} & \times & \text{_____ L} \times 10 & = & \text{_____ g amino acids} \\ \text{_____ \% lipids} & \times & \text{_____ L} \times 10 & = & \text{_____ g lipids} \end{array}$$

3. Calculate calories from dextrose, amino acids, and lipids by multiplying grams by calorie per gram.

$$\begin{array}{rclcl} \text{_____ g dextrose} & \times & 3.4 \text{ kcals/g} & = & \text{_____ kcals} \\ \text{_____ g amino acids} & \times & 4.0 \text{ kcals/g} & = & \text{_____ kcals} \\ \text{_____ g lipids} & \times & 9.0 \text{ kcals/g} & = & \text{_____ kcals} \end{array}$$

4. Add calories from dextrose, amino acids, and lipids (from #3) to determine total calories.

_____ total kcals

B. Calculate calorie and protein content given volume of base solution.

eg, 357 mL D₇₀, 1,200 mL AA₁₀, 250 mL L₂₀

1. Convert volume of dextrose, amino acids, and lipids to liters by dividing volume in milliliters by 1,000.

$$\begin{array}{rcl} \text{_____ mL dextrose/1,000} & = & \text{_____ L} \\ \text{_____ mL amino acids/1,000} & = & \text{_____ L} \\ \text{_____ mL lipids/1,000} & = & \text{_____ L} \end{array}$$

2. Multiply volume (L) by kcals/L for base solutions (see *Table 3*).

$$\begin{array}{rclcl} \text{_____ L dextrose} & \times & \text{_____ kcals/L} & = & \text{_____ kcals} \\ \text{_____ L amino acids} & \times & \text{_____ kcals/L} & = & \text{_____ kcals} \\ \text{_____ L lipids} & \times & \text{_____ kcals/L} & = & \text{_____ kcals} \end{array}$$

3. Add calories from dextrose, amino acids, and lipids (from #2) to determine total calories.

_____ total kcals

4. Determine protein content by multiplying volume of amino acids (L) by grams per liter for base solution (see *Table 3*).

* Omit lipid calculations for dextrose-based solutions.

Administration Techniques

Parenteral nutrition is usually administered continuously in the hospital because it requires less effort and manipulation of the IV lines and it is easier to manage fluid and electrolytes. For clients in extended care facilities, PN is usually cycled over 8 to 16 hours to allow time away from the IV pump.

Tapering (ie, gradually increasing or decreasing the infusion rate at the beginning or end of a cycle) is used to prevent severe changes in blood glucose due to the abrupt infusion or discontinuation of carbohydrate. Clients receiving cyclic PN usually need to be tapered down at the end of the cycle to prevent rebound hypoglycemia. It may also be necessary to taper the PN up for 1 or 2 hours to avoid hyperglycemia at the start of infusion. (See *Box 3*.)

If PN needs to be stopped unexpectedly, it should be replaced by D₁₀ for 1 hour. If time allows, PN should be decreased to half rate for at least 1 hour before discontinuing.

Monitoring Parenteral Nutrition

Careful monitoring, catheter care, formula preparation, and administration will help prevent PN-associated complications. Serum levels of electrolytes, blood urea nitrogen and creatinine, visceral proteins, blood sugars or urine reductions, weight, fluid intake and output, vital signs, and current medications should be monitored periodically. When complications occur, it is important to understand the cause and treatment. (See *Table 6*.)

SUMMARY

Enteral and parenteral nutrition support, once predominantly confined to acute care settings, is becoming more commonplace in extended care facilities. Technological advances in nutrition support, along with the aging of the population and the changing focus to health care outside the hospital, will ensure the continuation of this trend. The RD plays a vital role to ensure that nutrition support is provided in a safe and efficacious manner by assisting in the design and implementation of the nutrition care plan, monitoring and documenting the client's response to therapy, and recommending appropriate adjustments when necessary.

BOX 3: Calculating TPN Cycling Rates^{20*}

1-Hour Taper Down

Main rate = Total Volume / (Cycle Hours - 1/2 hour)

1st Hour Taper Rate = Main Rate / 2

2-Hour Taper Down

Main rate = Total Volume / [(Cycle Hours - 2 hours) + .75]

1st Hour Taper Rate = Base Rate / 2

2nd Hour Taper Rate = 1st Hour Taper Rate / 2

1-Hour Taper Up, 1-Hour Taper Down

Main rate = Total Volume / (Cycle Hours - 1 hour)

Taper Rates = Base Rate / 2

1-Hour Taper Up, 2-Hour Taper Down

Main rate = Total Volume / [(Cycle Hours - 2 hours) + .25]

1st Hour Taper Up and 1st Hour Taper Down Rates = Main Rate / 2

2nd Hour Taper Down Rate = 1st Hour Taper Rate / 2

2-Hour Taper Up, 2-Hour Taper Down

Main rate = Total Volume / [(Cycle Hours - 3 hours) + .50]

2nd Hour Taper Up Rate and 1st Hour Taper Down Rate = Base Rate / 2

1st Hour Taper Up Rate and 2nd Hour Taper Down Rate = 2nd Hour Taper Up Rate / 2

* Rates are expressed in mL/hour.

TABLE 6: METABOLIC COMPLICATIONS OF TPN²¹

Complication	Possible Causes	Clinical Findings	Prevention	Treatment
Macronutrient Substrate Complications				
Hyperglycemia	• Diabetes mellitus • Excessive dextrose infusion • Metabolic stress/sepsis • Corticosteroids • Peritoneal dialysis or CAVH-D • Obesity • Chromium deficiency	• Elevated blood glucose (> 200 mg%)	• Limit initial dextrose infusion to approximately 200-250 g/day. • Do not exceed maximum glucose utilization rate (5 mg/kg/min). • Monitor serum glucose.	• Decrease total dextrose (may need to increase fat kcals). • Add regular insulin to TPN or give subcutaneous or IV solution.
Hyperglycemic, hyperosmolar, nonketotic, dehydration/coma	• Sustained, uncontrolled hyperglycemia	• Very high blood glucose levels • Elevated serum osmolality • Osmotic diuresis • Metabolic acidosis • Lethargy and confusion • Coma	• Goal = < 200 mg/dL; < 250 mg/dL if at risk for hypoglycemia • Monitor: — blood, urine, glucose closely — serum OSM — fluid status (weight, I&Os, skin turgor)	• Immediate discontinuation of TPN • IV hydration, insulin • Correction of metabolic acidosis
Hypoglycemia	• Sudden discontinuation of TPN • Exogenous insulin administration not decreased when TPN discontinued	• Sweating • Lethargy or palpitations • Agitation • Faintness • Confusion • Coma	• Taper TPN over 1-2 hours. • Check glucose 1 hour after TPN discontinued in patients with impaired glucose metabolism.	• IV dextrose
Hypercapnia (elevated paCO_2)	• Excessive dextrose or total caloric intake in patients with obstructive or restrictive lung disease	• Increased paCO_2 • Respiratory distress	• Avoid excessive caloric or dextrose infusion. • Obtain indirect calorimetry measurement. • Adjust TPN regimen to meet needs.	• Decrease total caloric intake and/or increase calories as lipid.
Azotemia	• Dehydration • Renal insufficiency • Excessive amino acid infusion • Lean tissue catabolism	• Elevated BUN	• Adequate hydration prior to TPN initiation • Carefully assess protein requirements; avoid excessive amino acid infusion. • Provide adequate nutrition to minimize lean tissue catabolism. • Monitor BUN.	• Free water administration • Decrease amino acid infusion.

continued

TABLE 6: METABOLIC COMPLICATIONS OF TPN²¹

Complication	Possible Causes	Clinical Findings	Prevention	Treatment
Macronutrient Substrate Complications (cont.)				
Hypertriglyceridemia	• Excessive lipid infusion • Decreased clearance (stress/sepsis, liver failure) • Sustained hyperglycemia • Preexisting hyperlipidemia	• Lipemia	• Avoid excessive lipid infusion. • Monitor triglycerides weekly.	• Decrease lipid infusion. • If severe, provide only enough lipid to prevent EFAD (500 mL 10% fat emulsion 2-3 times/week).
Fluid and Electrolyte Disturbances/Metabolic, Acidosis, Alkalosis				
Fluid Overload	• Excessive fluid administration • Renal dysfunction, congestive heart failure, liver disease, trauma	• Rapid weight gain • Fluid intake > output • Increased blood pressure • Decreased serum sodium and hematocrit • Edema	• Avoid excessive fluid administration. • Close monitoring of: — weights — intake/output — laboratory parameters — physical signs (eg, pitting edema)	• Concentrate TPN solution; use 20% lipid emulsion. • Fluid restriction • Sodium restriction, if appropriate • Diuretic therapy
Dehydration	• Inadequate fluid intake • Excessive diuresis • Increased GI losses • Fever	• Decreased urine output • Orthostatic blood pressure • Increased serum sodium, BUN, hematocrit • Poor skin turgor • Thirst • Rapid weight loss	• Provide adequate fluid. • Replace insensible and GI losses. • Monitor fluid status.	• Fluid replacement
Hypokalemia	• Inadequate potassium supplementation during anabolism/refeeding • Increased GI losses (vomiting, diarrhea, fistulas) • Medications (eg, Lasix, amphotericin B, cisplatin, etc.)	• Metabolic alkalosis • Cardiac arrhythmias • Muscle weakness • Ileus	• Adequate potassium in TPN • Measure and replace losses. • Monitor serum levels daily until stable; biweekly thereafter.	• Increase potassium in TPN if mildly to moderately depleted. • Additional IV supplementation if severely depleted

continued

TABLE 6: METABOLIC COMPLICATIONS OF TPN²¹

Complication	Possible Causes	Clinical Findings	Prevention	Treatment
Fluid and Electrolyte Disturbances/Metabolic, Acidosis, Alkalosis (cont.)				
Hyperkalemia	• Renal insufficiency • Excessive potassium administration • Medications (eg, spironolactone) • Catabolism	• Weakness • Paresthesias • Hyporeflexia • Cardiac arrhythmias	• Avoid excessive potassium administration. • Monitor serum levels daily until stable; biweekly thereafter. • Monitor serum potassium daily in patients with renal insufficiency; restrict as appropriate.	• Decrease potassium in TPN.
Hyponatremia	• Fluid overload • SIADH • Excessive losses (urinary, GI, or through skin)	• Irritability • Confusion • Lethargy • Seizures	• Adequate sodium in TPN • Avoid excessive fluid administration. • Monitor serum sodium daily until stable; biweekly thereafter.	• Fluid restriction • Increase sodium in TPN if sodium depleted.
Hypernatremia	• Dehydration • Excessive sodium administration • Osmotic diuresis secondary to hyperglycemia • Pituitary tremors	• Thirst (difficult to assess in critically ill patients) • Restlessness • Muscle tremor and rigidity • Hyperactive reflexes • Coma • Convulsions	• Provide adequate fluid. • Avoid excessive sodium administration. • Monitor intake/output, urine sodium, Osm. • Monitor serum sodium daily until stable; biweekly thereafter.	• Replace fluid if dehydrated. • Decrease sodium in TPN if appropriate.
Metabolic Acidosis	• Increased intestinal losses of bicarbonate (diarrhea, fistulas) • Renal bicarbonate losses • Ketoacidosis (diabetes, starvation) • Lactic acidosis (shock, cardiac arrest) • Chronic renal failure or renal tubular acidosis • Excessive chloride in TPN (rare)	• Headache • Nausea/vomiting • Diarrhea • Convulsions	• Measure and replace intestinal losses. • Avoid excessive chloride in TPN.	• Increase acetate and decrease chloride in TPN.

continued

TABLE 6: METABOLIC COMPLICATIONS OF TPN²¹

Complication	Possible Causes	Clinical Findings	Prevention	Treatment
Fluid and Electrolyte Disturbances/Metabolic, Acidosis, Alkalosis (cont.)				
Metabolic Alkalosis	• Gastric acid losses (increased NG output) • Excess base administration	• Nausea/vomiting • Diarrhea • Sensory changes • Tremoring • Convulsions	• Measure and replace NG output.	• Treat underlying cause. • Increase chloride and decrease acetate in TPN. • If severe, may need IV hydrochloric acid.
Mineral Imbalances				
Hypocalcemia	• Hypoalbuminemia • Hypomagnesemia • Hyperphosphatemia • Hypoparathyroidism • Malabsorption • Inadequate calcium in TPN	• Muscular/abdominal cramping • Irritability • Confusion • Tetany • Seizures	• Adequate calcium in TPN • Monitor serum calcium biweekly; check ionized calcium if total calcium decreased.	• Correct magnesium deficiency. • Increase calcium in TPN if ionized calcium low.
Hypercalcemia	• Neoplasm • Renal insufficiency • Excessive vitamin D administration • Bone resorption caused by prolonged immobilization/stress	• Confusion • Lethargy • Dehydration • Muscle weakness • Abdominal pain • Nausea and vomiting • Constipation	• Monitor serum levels daily until stable; biweekly thereafter. • Restrict as appropriate.	• Decrease calcium in TPN. • Hydrate with isotonic saline.
Hypomagnesemia	• Increased GI losses (vomiting, diarrhea, fistula) • Increased urinary losses secondary to drugs (eg, cisplatin, amphotericin B) • Inadequate magnesium supplementation during anabolism/refeeding	• Weakness • Muscle tremors • Ataxia • Tetany • Paresthesias • Dizziness • Disorientation/irritability • Seizures • Cardiac arrhythmias	• Adequate magnesium in TPN • Monitor serum levels daily until stable; biweekly thereafter.	• Increase magnesium in TPN if mildly to moderately depleted. • Additional IV supplementation if severely depleted
Hypermagnesemia	• Renal insufficiency • Excessive magnesium administration	• Nausea/vomiting • Lethargy/weakness • Cardiac arrhythmias • Hypotension • Respiratory depression	• Monitor serum levels daily until stable; biweekly thereafter. • Monitor serum levels daily in patients with renal insufficiency; restrict as appropriate. • Avoid excessive magnesium administration.	• Decrease magnesium in TPN.

continued

TABLE 6: METABOLIC COMPLICATIONS OF TPN²¹

Complication	Possible Causes	Clinical Findings	Prevention	Treatment
Mineral Imbalances (cont.)				
Hypophosphatemia	• Inadequate phosphorus supplementation during anabolism/refeeding • Exogenous insulin administration • Chronic use of phosphate-binding antacids • Alcoholism • Diabetic ketoacidosis	• Paresthesias • Confusion • Altered speech • Lethargy • Respiratory failure • Decreased red blood cell function • Coma	• Supplement in TPN above standard amounts in patients at risk (diabetes, alcoholism, protein-calorie malnutrition). • Monitor serum levels daily until stable; biweekly thereafter.	• Increase phosphorus in TPN if mildly to moderately depleted. • Additional IV supplementation if severely depleted
Hyperphosphatemia	• Renal insufficiency • Excessive phosphorus administration	• Prolonged elevations may lead to tissue calcification	• Monitor serum levels daily until stable; biweekly thereafter. • Monitor serum levels daily in patients with renal insufficiency; restrict as appropriate. • Avoid excessive phosphorous administration.	• Decrease phosphorous in TPN.
Other				
Refeeding Syndrome	• Rapid or excessive dextrose infusion (especially in malnourished patients)	• Hyperglycemia • Hypophosphatemia • Hypokalemia • Hypomagnesemia • Edema • Pulmonary edema/CHF	• Identify patients at risk (chronically malnourished, nutritionally depleted patients). • Replete serum electrolyte deficiencies prior to TPN initiation. • Limit initial dextrose infusion to approximately 150-200 g/day. • Supplement phosphorus in TPN. • Advance TPN cautiously. • Routinely administer 3 mg thiamin/day. • Monitor serum glucose, electrolytes, phosphorous, and magnesium daily until stable; biweekly thereafter.	• Decrease infusion rate. • Replete serum electrolyte, phosphorus, magnesium deficiencies; monitor closely. • Limit fluid in presence of edema.

continued

TABLE 6: METABOLIC COMPLICATIONS OF TPN²¹

Complication	Possible Causes	Clinical Findings	Prevention	Treatment
Other (cont.)				
Essential Fatty Acid Deficiency (EFAD)	• Prolonged insufficient lipid infusion	• Dry, scaly skin • Hair loss • Thrombocytopenia • Triene:tetraene > 0.4	• Provide at least 500 mL 10% fat emulsion 2-3 times/week.	• Daily lipid infusion • Cutaneous application of linoleic acid-rich oils if IV lipid contraindicated
Trace Mineral Deficiencies	• Inadequate supplementation during long-term TPN • Excessive losses via GI tract (diarrhea, fistula output)	• Varies depending upon specific deficiency	• Adequate supplementation	• Supplement deficient nutrient.
Metabolic Bone Disease	• Etiology unclear/possibly multifactorial • Possible etiologies include: — altered vitamin D metabolism — aluminum toxicity — cyclic versus continuous TPN — protein-induced calcium loss	• Bone pain • Back pain • Pathological fractures • Hypercalciuria	• Moderate nutrient provision • Monitor minerals and other TPN solutions for presence of aluminum.	• Omit vitamin D from TPN for several months; monitor symptoms. • Continuous versus cyclic TPN

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12 CHAPTER

Managing the Client with Compromised Pulmonary Function

Multiple interactions between nutrition and respiratory function¹⁻³ are frequently critically important in caring for clients with impaired respiratory function. Since respiration and nutrition are interdependent, adequate nutritional status is necessary to maintain effective ventilatory muscle function.³ Because of the complexity of nutrition and respiratory interaction, a detailed nutrition assessment is essential. A nutrition support team composed of the physician, registered dietitian, respiratory care practitioner, professional nurse, and pharmacist is ideal but unrealistic. However, all members of the care plan team should be familiar with the nutrition assessment process⁴ and be able to provide needed information to the registered dietitian, especially in light of the home care continuum where the only caregiver who sees the client on a regular basis may be the home health aide, professional nurse, respiratory care practitioner, or even a service technician.

MALNUTRITION

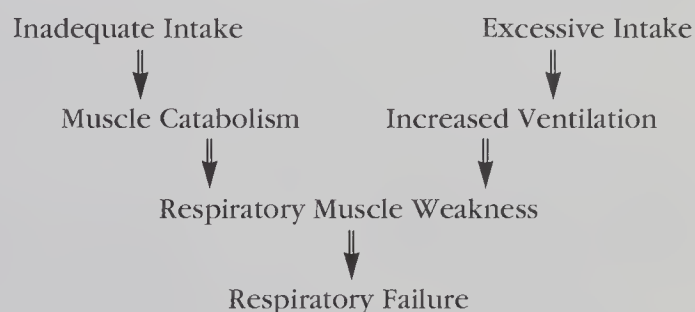
Malnutrition is a state of impaired health due to undernutrition, overnutrition, an imbalance of nutrients, or the body's inability to use the nutrients ingested. Malnourished persons do not tolerate illness well. They show delayed wound healing, experience a higher incidence of episodes of acute respiratory failure, have higher mortality rates, and are particularly susceptible to infection and complications of illness. They may be unable to withstand demanding medical treatments.^{5,6} The malnourished client is also a prime candidate for respiratory insufficiency.^{7,8} *Table 1* suggests food preparation techniques to increase caloric and protein intake.

Malnutrition/Ventilatory Function

In a state of fasting, glycogen stores are exhausted within the first 24 hours. If calorie starvation persists, fat and protein stores are sufficient to sustain minimal bodily functions for an additional 30 to 60 days if hydration is adequate. Studies of hospitalized clients receiving inadequate amounts of protein and calories for as little

as 2 to 3 days have revealed measurable reductions in cardiac, renal, respiratory, and immune function.^{1,2,9} In relation to respiratory function, malnutrition results in a reduction in minute ventilation and inspiratory flow, and in blunting of the hypoxic drive. Clients with respiratory dysfunction and malnutrition may not respond appropriately to arterial hypoxemia.⁴ In the respiratory system, the diaphragm and other respiratory muscles are not spared from muscle wasting. They, along with the skeletal muscles, lose muscle mass. Respiratory muscle strength can also diminish, producing a decrease in forced vital capacity (FVC) and forced expiratory volume in 1 second (FEV₁). (See *Box 1*.) These decreases in pulmonary function have severe consequences in terms of effective cough and secretion clearance. (See *Figure 1*.)

Figure 1
Effects of Nutrition in Respiration



In a broad sense, pulmonary diseases and conditions can be categorized as obstructive airflow diseases, restrictive diseases, or neuromuscular diseases and conditions which can be acute or chronic. Common diagnoses include chronic obstructive pulmonary disease (COPD), bronchial asthma, pneumonia, idiopathic pulmonary fibrosis, lung cancer, bronchitis, emphysema, Guillain-Barre syndrome, muscular dystrophies, and amyotrophic lateral sclerosis (ALS), as well as spinal cord injury and closed head injury.

TABLE 1: PREPARATION TECHNIQUES TO INCREASE CALORIES AND PROTEIN**CALORIES**

FOOD SOURCES	PREPARATION TO INCREASE CALORIES
Butter or Margarine 1 teaspoon = 45 calories	• Add to soups, mashed and baked potatoes, hot cereals, grits, rice, noodles, and cooked vegetables; top muffins, toast, and crackers. • Stir into cream soups, sauces, and gravies. • Combine with herbs and seasonings and spread on cooked meats, hamburgers, and fish and egg dishes. • Use melted butter or margarine on vegetables and with seafoods such as shrimp, scallops, crab, and lobster.
Whipped Cream 1 tablespoon = 15-30 calories	• Use sweetened on hot chocolate, desserts, gelatin, puddings, fruits, pancakes, and waffles. • Fold unsweetened into mashed potatoes or vegetable purees.
Table Cream 1 tablespoon = 30-50 calories	• Use in cream soups, sauces, egg dishes, batters, puddings and custards, and over fresh fruit. • Use on hot or cold cereal. • Use in milkshakes or fruit drinks. • Mix with pasta, rice, and mashed potatoes. • Pour on chicken and fish while baking. • Use as a binder in hamburgers, meatloaf, and croquettes. • Add to milk in recipes. • Make hot chocolate with cream and add marshmallows.
Cream Cheese 1 ounce = 100 calories	• Spread on breads, muffins, fruit slices, and crackers. • Add to vegetables. • Roll into balls and coat with chopped nuts, wheat germ, or granola.
Sour Cream 1 tablespoon = 30 calories	• Add to cream soups, baked or whipped potatoes, macaroni and cheese, vegetables, sauces, salad dressings, stews, baked meat, and fish. • Make a dip for vegetables. • Use as a topping for cakes, fruit, gelatin desserts, breads, and muffins. • Scoop on fresh fruit; add brown sugar and let the dessert sit in the refrigerator for a while.
Salad Dressings and Mayonnaise 1 tablespoon = 60-100 calories	• Spread on sandwiches and crackers. • Combine with meat, fish, and egg or vegetable salads. • Use as a binder in croquettes. • Use in sauces and gelatin dishes.
Honey, Jam, and Sugar 1 tablespoon = 60 calories	• Add to bread, cereal, milk drinks, and fruit and yogurt desserts. • Use as a glaze for meats, such as chicken.
Granola 1/2 cup = 300 calories	• Use in cookie, muffin, and bread batters. • Sprinkle on vegetables, yogurt, ice cream, pudding, custard, and fruit. • Layer with fruits and bake. • Mix with dry fruits and nuts for a snack. • Substitute for bread or rice in pudding recipes.

continued

TABLE 1: PREPARATION TECHNIQUES TO INCREASE CALORIES AND PROTEIN**CALORIES (continued)**

FOOD SOURCES	PREPARATION TO INCREASE CALORIES
Dried Fruits 1/2 cup = 100-200 calories	• Cook and serve for breakfast or as a dessert or snack. • Add to muffins, cookies, breads, cakes, rice and grain dishes, cereals, puddings, and stuffings. • Bake in pies and turnovers. • Combine with cooked vegetables such as carrots, sweet potatoes, yams, and acorn and butternut squash. • Combine with nuts or granola for snacks.
Food Preparation Tips	• Saute and fry foods when possible because these cooking methods add more calories than baking or broiling. • Add sauces or gravies. • Prepare hot cereals using whole milk instead of water. • Bread meats and vegetables.

PROTEIN

FOOD SOURCES	TIPS FOR INCLUDING PROTEIN
Hard or Semisoft Cheese (eg, cheddar, Jack, brick)	• Melt on sandwiches, bread, muffins, tortillas, hamburgers, hot dogs, other meats or fish, vegetables, eggs, and desserts such as stewed fruit or pies. • Grate and add to soups, sauces, casseroles, vegetable dishes, mashed potatoes, rice, noodles, or meatloaf.
Cottage Cheese/Ricotta Cheese	• Mix with or use to stuff fruits and vegetables. • Add to casseroles, spaghetti, noodles, and egg dishes such as omelets, scrambled eggs, and souffles. • Use in gelatin, pudding-type desserts, cheesecake, and pancake batter. • Use to stuff crepes and pasta shells or manicotti.
Milk	• Use in beverages and in cooking when possible. • Use in preparing foods, such as hot cereal, soups, cocoa, or pudding. • Add cream sauces to vegetable and other dishes. • Use evaporated milk or sweetened condensed milk instead of milk or water.
Powdered Milk	• Add 1/3 cup of nonfat dry powdered milk to each cup of regular milk for "double strength" milk. • Add to cream soups and mashed potatoes. • Add to regular milk, yogurt, and milk drinks, such as pasteurized eggnog and milkshakes. CAUTION: Powdered milk may contain bacteria. Add powdered milk to a small amount of boiling water before adding to beverage or food that will not be cooked prior to use. These mixed beverages and food items need to be used within 24 hours of the mixing time. • Use in casseroles, meatloaf, breads, muffins, sauces, cream soups, puddings and custards, and milk-based desserts.
Commercial Protein Supplements	• Use nutrition supplements such as Instant Breakfast®, Sustacal®, Ensure®, Great Shake®, or Health Shake®. These may be purchased in grocery stores or pharmacy departments. • Use instant breakfast powder in milk drinks and desserts. • Mix with ice cream, milk, and fruit or flavorings for a high-protein milkshake.

continued

TABLE 1: PREPARATION TECHNIQUES TO INCREASE CALORIES AND PROTEIN**PROTEIN (continued)**

FOOD SOURCES	TIPS FOR INCLUDING PROTEIN
Ice Cream, Yogurt, and Frozen Yogurt	• Add to carbonated beverages, such as ginger ale; add to milk drinks, such as milkshakes. • Add to cereals, fruits, gelatin desserts, and pies. • Blend or whip with soft or cooked fruits. • Sandwich ice cream or frozen yogurt between enriched cake slices, cookies, or graham crackers.
Eggs and Egg Whites	• Add chopped, hard-cooked eggs to salads and dressings, vegetables, casseroles, and creamed meats. • Beat eggs into mashed potatoes, vegetable purees, and sauces. Add extra whites to quiches, scrambled eggs, custards, puddings, and pancake and french toast batter. • Make a rich custard with egg yolks, double strength milk, and sugar. • Add extra hard-cooked yolks to deviled egg filling and sandwich spreads. • CAUTION: Do not serve raw or undercooked egg products due to risk of salmonella bacteria causing illness.
Nuts, Seeds, and Wheat Germ	• Add to casseroles, breads, muffins, pancakes, cookies, and waffles. • Sprinkle on fruit, cereal, ice cream, yogurt, vegetables, salads, and toast as a crunchy topping. • Use in place of bread crumbs. • Blend with parsley or spinach, herbs, and cream for a noodles, pasta, or vegetable sauce. • Roll banana in chopped nuts.
Peanut Butter	• Spread on sandwiches, toast, muffins, crackers, waffles, pancakes, and fruit slices. • Use as a dip for raw vegetables, such as carrots, cauliflower, and celery. • Blend with milk drinks and beverages. • Swirl through soft ice cream and yogurt. • Spread on a banana; then, roll banana in crushed dry cereal or nuts.
Meat and Fish	• Add chopped cooked meat or fish to vegetables, salads, casseroles, soups, sauces, and biscuit dough. • Use in omelets, souffles, quiches, sandwich fillings, and chicken and turkey stuffings. • Wrap in pie crust or biscuit dough as turnovers. • Add to stuffed baked potatoes. • Eat calf or chicken liver or heart, which are especially good sources of protein, vitamins, and minerals.
Beans	• Cook and use dried peas and beans and bean curd (tofu) in soups or add to casseroles, pastas, and grain dishes that also contain cheese or meat. • Mash with cheese and milk.

Sources:

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BOX 1: Definitions of Common Terms

- **Arterial Blood Gas (ABG)** — Measures status of body's respiratory environment via blood; also indicator of acid base balance.
 Normals: (at sea level)
 pH 7.35-7.45 (arterial)
 PaCO₂ 35-45 mm Hg (arterial)
 PaO₂ 80-100 mm Hg (arterial)
 HCO₃ 22-26 mEq/L (arterial)
 SaO₂ 96%-98% (arterial)
- **Minute Ventilation (V_E)** — The volume of air exchange in a minute.
- **Respiratory Rate** — The rate of breathing at rest, about 14 breaths per minute.
- **Forced Expiratory Volume (FEV₁)** — The volume of air that can be forcibly expelled in 1 second following full inspiration.
- **Continuous Mandatory Ventilation (CMV)** — Ventilator fully supports client's breathing hypercapnia, excess of CO₂ in the blood.
- **Hyperventilation** — The increased rate and depth of breathing.
- **Tidal Volume** — The volume of gas in each breath.
- **Continuous Positive Airway Pressure (CPAP)** — Ventilator administers air/oxygen to the lungs under a continuous pressure that never returns to zero.
- **PaCO₂** — The partial pressure of CO₂ in arterial blood which reflects alveolar ventilation.
- **Forced Vital Capacity (FVC)** — The maximal volume of air that can be forcefully and rapidly exhaled following a maximum inspiration.
- **Hypoxemia** — An abnormal deficiency of oxygen in arterial blood.
- **Hypoxic drive** — The low arterial oxygen pressure stimulus to respiration that is mediated through the carotid and aortic bodies.
- **Basal Energy Expenditure (BEE)** — The amount of energy needed to maintain essential basic body functions such as respiration, circulation, temperature, peristalsis, and muscle tone.
- **Estimated Energy Expenditure (EEE)** — The amount of energy estimated via equation to be used by both ventilator-dependent and spontaneously breathing hospitalized patients.
- **Respiratory Quotient** — The body's total exchange of oxygen for carbon dioxide, expressed as the ratio of the volume of carbon dioxide produced to the volume of oxygen consumed per unit of time at steady state conditions.
- **NADH** — Abbreviation for nicotine adenine dinucleotide reduced form.
- **FADH₂** — Symbol for flavin adenine dinucleotide reduced form.
- **VCO₂** — Symbol for carbon dioxide output per unit of time.
- **VO₂** — Symbol for oxygen uptake.
- **Phrenic Nerve Stimulation** — Stimulation of the motor nerve to the diaphragm.

Etiology of Malnutrition in Lung Disease

Potential causes of malnutrition in chronic lung disease include anorexia, gastrointestinal disturbances, malabsorption, increased metabolic requirements, and intake-reducing mealtime dyspnea and fatigue. Medications commonly prescribed to treat lung diseases may affect appetite and nutritional status. (See *Box 2*.) Economic, psychosocial, and cultural factors such as poor dentition, increased day-to-day stress, depression, lack of income to purchase proper food, limited transportation or access, inadequate preparation facilities, lack of knowledge, and religious or cultural beliefs are all factors which may lead to impaired food intake.⁸

NUTRITION ASSESSMENT

Introduction

Nutrition support should be based on objective data that can identify the type and amount of nutrition required. The baseline nutritional state of the client must first be determined. Once that determination is made, nutrition support should be based on accurate measurements of calories and protein requirements. Given the prevalence of nutrition problems in respiratory clients, a nutrition assessment should be performed on every respiratory client admitted to the health care facility.

BOX 2: Common Medications

The following medications commonly used with pulmonary-compromised or ventilator-dependent clients have drug-nutrient interactions (DNI) that must be addressed during the nutrition assessment phase so that clients may be provided with DNI education.

I. PREDNISONE

- Increases appetite
- Increases potassium and vitamin C loss
- Intolerance to glucose
- Increases sodium retention
- Decreases calcium absorption

II. THEOPHYLLINE

- Avoid caffeine — increases the incidence of adverse effects.
- Avoid charbroiled foods — increases elimination of the drug and reduces its half-life by as much as 50%.
- High-protein foods increase elimination. Eat the same amount of protein foods each day.
- Food may slow absorption of drug but prevent GI distress.

III. ALBUTEROL, TERBUTALINE, METAPROTERENOL, PIRBUTEROL (fast-acting bronchodilators)

- Limit caffeine and xanthine intake.
- May cause high blood sugar in diabetics

IV. IPRATROPIUM BROMIDE (anticholinergics)

- Side effects may include dry mouth, stomach upset, metallic/bitter taste, and/or excessive thirst.

V. ACETYLCYSTEINE (mucolytic)

- Side effects may include nausea, metallic odor/taste, dry mouth.
- Provide 1/2 to 1 hour before meals to decrease nausea.
- Give with cola or soft drink to disguise taste.

History

A thorough assessment of the client's nutritional status includes medical, social, and dietary histories. Histories may give clues to the type of nutrition problems the RD may encounter when treating the respiratory client.

Numerous diagnoses identified in the medical history may contribute to malnutrition (ie, alcohol and drug use, chronic diseases, recent major surgery or illness, increased metabolic needs, and/or recent significant weight loss). Detection of mental deterioration, constipation, poor eyesight, hearing loss, slowed responses, effects of drugs being taken, etc. may affect the nutrition status of the respiratory client.

A social history may identify inadequate income, inability to purchase one's own food, living or eating alone, physical or mental handicaps, smoking, and substance abuse problems. For the older adult, confusion secondary to environmental changes, unsuitable housing conditions, lack of socialization at meals, psychological problems, and poverty may add to the risks.

A detailed diet history including a review of the usual pattern of food intake and the food selection variables that dictate food intake will identify potential problems. This history may include a 24-hour recall, food frequency questionnaire and additional information such as weight history, previous diet changes, use of supplements, and food intolerances.

Physical Findings

Physical findings suggestive of malnutrition that may be found in this population include cachexia, joint pain, muscle weakness, ascites, ecchymosis, impaired skin integrity, poor skin turgor, and lack of or decreased smell and taste. A complete and thorough history may indicate an already nutritionally depleted state. Furthermore, chronic illnesses such as COPD, diabetes, peptic ulcer disease (PUD), congestive heart failure (CHF), coronary artery disease (CAD), renal or liver dysfunction, carcinoma, and immune diseases are also frequently associated with a high probability of malnutrition.^{5,7,9}

Anthropometrics

The use of anthropometric measurements can also be helpful in determining the nutritional status of the client. These measurements reflect both growth and development and increases or decreases in body fat and muscle tissue. These measurements can then be compared with the standard measurements for persons of the same age and sex as the client, as well as comparing current findings with previous measurements on the same client. (See Chapter 14.) Anthropometric measurements are used to establish a nutrition baseline. By establishing a reproducible testing protocol, the practitioner can assess changes in client nutritional status for

weeks, months, or even years. The anthropometric measurement system also allows objective goal measurement within the plan of care.

Anthropometric measurements are relatively easy to perform and require little equipment. Their accuracy and usefulness are limited by poor technique, inexperience, inaccurate measuring equipment, incorrect readings, or inaccurate recording. However, on the plus side, these measurements can be compared with standard normal values to assess the degree of malnutrition and provide accepted estimates of protein energy malnutrition.

Laboratory Testing

Laboratory tests tend to reflect body changes more quickly and be more accurate than anthropometric tests. Albumin, prealbumin, serum transferrin, and hemoglobin/hematocrit are often assessed, but no one test constitutes a perfect assessment of a client's nutritional status.^{1,8}

By combining history, physical signs, and objective anthropometric and laboratory measurements, the RD can make an adequate assessment of the nutritional status of the client and determine the client's energy needs.

Determination of Client's Metabolic Function

Basal metabolism is the energy required to carry on vital body processes at rest. These processes include circulation, respiration, cell maintenance, etc. The basal metabolic rate (BMR) is the rate at which a person utilizes energy for these vital body processes. It is measured in the morning after awakening from sleep, at least 12 hours after the last meal. The resting energy expenditure (REE) is another method of determining energy needs at rest.⁵

Total body energy needs are the sum total of BMR or REE, energy expenditure for physical activity, and energy expenditure due to injury factors. More recently, the REE has been the test of choice to measure the body's energy needs at rest. The REE is not measured under the same conditions as the BMR; instead, the REE is measured with the client lying in bed, awake and aware of the surroundings, and may include the influence on metabolism of a previous meal. However, since there is less than a 10% difference between the REE and the BMR, the terms are used interchangeably.^{5,10}

Various equations can be used to estimate the REE. Harris Benedict or Ireton Jones equations may be used to determine metabolic needs. Indirect calorimetry is the preferred method for establishing energy needs in the pulmonary-compromised and ventilator-dependent client, those who are critically ill, or those who have numerous nutritional stress factors.^{2,10} Indirect calorimetry uses respiratory gas exchange measurements to

quantify caloric needs. By applying the Weir equation, which relates energy expenditure to measured O_2 consumption and CO_2 production, increased accuracy is achieved.^{2,11} Indirect calorimetry, however, is expensive and generally not appropriate for clients in the extended care arena. If either of these is used, the RD should routinely assess for overfeeding. (See *Box 3*.)

Clinical Application of the REE

All clients with a body weight less than 90% of ideal body weight (IBW) or with an unplanned weight loss of 5% of usual body weight (UBW) in 30 days, 7.5% in 90 days, or 10% in 6 months, or with an unintentional weight loss of 10 pounds or more should be considered for nutrition repletion, particularly those with respiratory muscle dysfunction.^{1,3} Under normal circumstances, the recommended caloric intake for repletion is 1.5 times the REE, but with the additional energy demands, caloric intake in the range of 1.5 to 1.7 times the REE may be required. Substrate distribution is dependent on multiple factors, but in general will be as follows⁹:

Protein	15%-25%
Fat	30%-60% (not to exceed 2.5 g/kg)
CHO	30%-50% (Decrease % if $PaCO_2$ is significantly elevated.)

Protein Needs

Most clients with respiratory failure who require mechanical ventilation are in a hypercatabolic state and catabolize their protein stores in order to meet their immediate metabolic needs. Providing adequate calories as well as protein is vital.

When setting protein levels, assess the client's renal and liver function and wound-healing needs. Ongoing evaluation of a client's tolerance to protein

load should also be assessed. Nitrogen balance studies can guide protein needs. Excessive protein intake increases respiratory drive and can result in respiratory distress in clients who cannot increase their alveolar ventilation. If nitrogen balance is greater than positive 4 g to 6 g per day, the protein content of diet/feedings may need to be decreased.

Protein Needs in the Pulmonary-compromised Patient

- Maintenance = 1.2 g-1.9 g of protein per kg body weight
- Repletion = 1.6 g-2.5 g of protein per kg body weight

Fluid Requirements

Adequate fluid intake is extremely important for clients with respiratory disorders^{1,3,12} because proper function of the lung's mucociliary clearance mechanism requires good hydration. The need for fluids must be carefully balanced with the potential for fluid retention, secondary to cardiovascular problems that may coexist. Sodium restriction may be necessary to prevent fluid build-up in clients with congestive heart failure, cor pulmonale, or acute respiratory distress syndrome. Fluid status should be monitored by urine specific gravity, serum electrolyte measurements, and clinical signs of edema. It may be necessary to provide a more concentrated enteral or parenteral feeding. In some cases, input/output may need to be closely monitored to assure adequate hydration. Unless contraindicated, pulmonary clients should drink plenty of fluids to decrease mucous viscosity, which facilitates expectoration of mucous from the lungs. The RD should counsel clients on the variety of fluids available and monitor intake.

BOX 3: Equations Used to Estimate Resting Energy Expenditure

• Harris Benedict Equation:

(weight in kg and height in cm):

Men: Basal Energy Expenditure (BEE)

$$(\text{cal/day}) = 66.5 + (13.8 \times \text{weight}) + (5 \times \text{height}) - (6.8 \times \text{age})$$

Women: Basal Energy Expenditure (BEE)

$$(\text{cal/day}) = 655.1 + (9.6 \times \text{weight}) + (1.8 \times \text{height}) - (4.7 \times \text{age})$$

• Ireton Jones Equation:

Estimated Energy Expenditure (EEE)

$$(\text{vent}) = 1925 - (10 \times \text{age}) + (5 \times \text{weight}) + 281 \text{ if male} + 292 \text{ if trauma present} + 851 \text{ if burn present}$$

$$\text{EEE (spontaneous breath)} = 629 - (11 \times \text{age}) + (25 \times \text{weight}) - 609 \text{ if obesity present}$$

Fluid Status

- Congestive heart failure/edema = 25 cc/kg of body weight
 - Normal fluid status = 25 cc-30 cc/kg of body weight
 - 1 mL/kcal
 - 100 mL/kg for first 10 kg body weight + 50 mL/kg for second 10 kg body weight + 15 mL/kg for remaining kg body weight
- or
- Shortcut to this method:
 $(\text{Kg body weight} - 20) \times 15 + 1,500 \text{ mL}$

Reprinted with permission. JC Chidester and AA Spangler. Fluid intake in the institutionalized elderly. *J Am Diet Assoc.* 1997;97:23-28.

Pharmacological Agents

Nutrition repletion in respiratory clients is often hindered by some of the necessary pulmonary therapeutic measures. Bronchodilators and mucolytics, for example, may produce nausea and anorexia. The dehydrating effects of oxygen by nasal cannula can decrease the sense of smell and taste and hence appetite. Other medications, such as antibiotics and corticosteroids, may interact with nutrients and render them less available for absorption or inhibit specific metabolic enzymes. Because of oxygen demands throughout the body, frequent small meals may be necessary. All these factors, along with shortness of breath, the increased work of breathing, and greater prevalence of peptic ulcers in respiratory clients, increase the risk of malnutrition.^{1,8}

Micronutrients

Maintenance of micronutrients also has a direct effect on respiratory muscle function. Phosphate, magnesium, calcium, and potassium play important roles in the respiratory process. Severe hypophosphatemia may occur as antacids containing aluminum or magnesium-binding phosphate. Correction of hypophosphatemia in ventilated patients improves transdiaphragmatic pressure response to phrenic nerve stimulation. Magnesium deficiency is linked to impaired respiratory muscle strength. Hypo- and hyperkalemia are associated with generalized muscle weakness. Calcium is involved in muscle excitation and contraction.^{4,11} Since many pulmonary clients avoid the use of milk and dairy products secondary to the belief that these products increase mucous production, the nutrition assessment should check for adequacy of calcium and phosphorus in the diet and supplement if necessary.¹³

The Feeding Process

The methods by which clients are fed also carry respiratory implications. A functioning gastrointestinal tract is

always the route of choice for maintaining adequate nutrition intake. However, to prevent or treat severe malnutrition, invasive nutrition support may be necessary. Clients who may require this route of nutrition include those who are unable to consume adequate calories orally (specifically ventilator-dependent clients or those with bronchopulmonary dysphasia), those with weight loss due to chronic inability to maintain adequate oral intake (emphysema or cystic fibrosis (CF)), those with severe or prolonged gastrointestinal (GI) tract dysfunction, and those who need to improve nutritional status prior to surgery.¹⁴

NUTRITION/CHEMICAL DYNAMICS

Regardless of the food eaten or the method used for feeding, the process of catabolism of the food's protein, fats, and carbohydrates begins with the process of digestion, continues through glycolysis brought about by the process of oxidation, and ends with the citric acid cycle, also called the Krebs cycle or the tricarboxylic acid cycle. The citric acid cycle accounts for approximately two-thirds of the total oxidation of carbon compounds in most cells, with its major end products being carbon dioxide and two dinucleotides, NADH and FADH₂.¹⁵

NUTRITION/RESPIRATORY QUOTIENT RELATIONSHIPS

Oxygen is required for the complete release of the energy available in the three fuel-producing nutrients (carbohydrates, fats, and proteins).¹ A simplistic way of looking at respiratory failure is to define it as a failure of the pulmonary exchange of oxygen and carbon dioxide. Its common manifestations are hypoxemia, deficient partial pressure of oxygen in the blood, and hypercapnia, excess carbon dioxide in the blood.

Nutrition therapy is guided by the respiratory quotient (RQ). The RQ can reflect over- or underfeeding or inappropriate nutrient mix since it represents the ratio of carbon dioxide produced and oxygen consumed, per unit of time, by each of the fuel-producing nutrients ($V_{\text{CO}_2} \Delta V_{\text{O}_2}$). The RQ is determined by the relative amounts of protein, fat, and carbohydrate that a person is metabolizing.

The following represent RQs:

- | | |
|-----------------------------|-----------|
| • Proper feeding | 0.7-1.0 |
| • Fat oxidation | 0.7 |
| • Protein oxidation | 0.8-0.82 |
| • Carbohydrate oxidation | 1.0 |
| • Mixed substrate oxidation | 0.85 |
| • Lipogenesis/overfeeding | 1.02-1.30 |
| • Ketosis/underfeeding | < 0.7 |

While the differences may appear small, they are significant. For example, the RQ difference between fat and carbohydrate is about 30%. This would theoretically result in 25% less carbon dioxide produced per calorie of fat. The number of calories consumed also influences RQ because excess caloric intake will be converted to fat during the process of lipogenesis. The RQ, which usually has a value of 1.00 or less, will be in the range of 1.02 to 1.30 during overeating or overfeeding, resulting in excess V_{CO_2} .^{4,11}

NUTRITION CONSIDERATIONS IN VENTILATOR-DEPENDENT CLIENTS

Nutrition support plays a critical role in the client recovering from acute respiratory failure who requires mechanical ventilation. Respiratory muscle weakness is a central factor in failure to wean from mechanical ventilation, and nutritional status is linked closely to respiratory muscle strength and endurance.^{7,11}

While underfeeding individuals with pulmonary disease can lead to malnutrition, studies have shown overfeeding in a ventilator client may result in prolongation of weaning and/or respiratory failure, fluid overload, glucose intolerance, hepatic steatosis, and decreased pulmonary surfactant synthesis. Because oxygen uptake and carbon dioxide excretion are an integral part of nutrition, matching a client's energy and nutrition needs with ventilatory needs can become a challenge. Using ASPEN¹⁴ guidelines for indications/administration/monitoring of enteral or parenteral nutrition is an acceptable protocol. The RD needs to recognize that changes in pulmonary parameters may be related to changes in ventilator settings and unrelated to nutrition. Good communication with all team members is essential for positive nutrition outcomes.

NUTRITION NEEDS IN RESPIRATORY CLIENTS

Nutrition needs vary widely within this group of clients, depending on the underlying disease process and on prior nutritional status. In the respiratory client, carbohydrate has often been contrasted with fat. The major problem resulting from carbohydrate intake in clients with respiratory disorders occurs when glucose has been given in excess. The increased V_{CO_2} has induced respiratory difficulty in clients being weaned from mechanical ventilators. This generally occurs when glucose is provided via parenteral route. Therefore, it is recommended that critically ill clients relying on parenteral nutrition be given lipids infused with the glucose solutions to prevent excess CO_2 production. By feeding appropriately, one can decrease the load on the respiratory muscles of the client with respiratory disease; that is, the RQ can be manipulated by changing the diet.¹¹ If possible, indirect calorimetry should be per-

formed weekly for hemodynamically stable clients until nutrition outcomes are positive.

Protein-calorie malnutrition should be suspected in any client with COPD and acute respiratory failure. It is quite likely that preexisting nutrition deficits will require the use of aggressive nutrition support. This protocol should be initiated as early as possible with goals being to replace deficits in addition to conserving body protein stores.

Chronic Obstructive Pulmonary Disease

The prevalence of chronic malnutrition and weight loss in clients with chronic obstructive pulmonary disease (COPD), particularly emphysema, ranges from 24% to as high as 60%, confirming that a significant number of respiratory clients may experience the effects of malnutrition. The most common pattern of weight change seen in COPD is a slow decline in weight or a cyclic step decline in weight, with plateau periods during which weight is stable.⁹

Energy requirements vary for these clients but may be near 150% of REE calculated by the Harris-Benedict equation.³ Enteral nutrition supplementation by mouth or, in extreme cases, by feeding tube can be used to increase total caloric intake. When the overall treatment goal for COPD clients is to reduce the carbon dioxide level in the blood, nutrition support that provides increased fat calories and decreased carbohydrate calories in addition to preventing overhydration may help improve a client's overall pulmonary function.

For those clients able to take adequate food orally, a soft diet with no tough or stringy foods is recommended. When abdominal bloating is a problem, limitation of foods associated with gas formation can be helpful. The use of small, concentrated feedings at frequent intervals lessens fatigue and is often successful in increasing overall intake. For clients with peripheral edema, sodium may need to be restricted and potassium levels increased if using certain types of diuretics. This sodium restriction may be difficult to achieve if a client is receiving significant amounts of sodium from continuous high volume normal saline aerosols. Fiber should be gradually increased with the use of prune juice, fruits and vegetables, and complex carbohydrates such as breads and cereals. In certain cases, supplements of vitamins A and C may be used to allow healing and formation of tissue. B-complex may also be needed for energy metabolism.^{3,12}

Foods Associated with Gas Formation

- Raw apples
- Melons
- Cabbage
- Cauliflower
- Onions
- Sauerkraut
- Legumes
- Beer

Cystic Fibrosis

Weight loss in clients with cystic fibrosis (CF) is strongly associated with respiratory tract infections. Reduced body weight and poor nutritional status are common in this group of clients because of pancreatic insufficiency and the resultant intestinal malabsorption. Factors that interfere with adequate intake and retention of nutrients include shortness of breath, coughing and cough-induced vomiting, gastrointestinal discomfort, anorexia during episodes of infection, impaired sense of smell and taste, and glucosuria. Growth retardation and difficulty in maintaining desired weight-for-height are common problems.

The goal of nutrition care in the CF client is to control malabsorption, to provide adequate energy, protein, and other nutrients to promote optimal growth and maintenance of ideal weight-for-height, and to prevent nutritional deficiencies.^{3,9,12}

Pancreatic enzymes are taken with meals and snacks to improve the digestion of carbohydrates, protein, and fat. Even when replacement enzymes are taken, digestion is often not complete.

The amount of energy required by the client with CF depends on the severity of lung disease, presence of infection, control of malabsorption, rate of growth, and physical activity level. Caregivers need to be aware that clients may tire of the need to keep energy intake high and conflicts around eating may develop within the family.

Energy and protein intake can be increased by increasing the food portions at meals, adding extra snacks, and selecting foods of high-caloric density. Nocturnal supplementation via feeding tube is an alternative available to those who are unable to meet nutrition needs via the oral route.

NUTRITION SCREENING

All clients receiving respiratory care in the extended care arena should undergo some type of nutrition screening. The Nutrition Screening Initiative's DETERMINE Checklist, Level I Screen and Level II Screen, can be helpful tools. (See Chapter 14.) The DETERMINE Checklist helps clients recognize aspects of their eating habits and lifestyle that may place them at nutritional risk, and it provides basic nutrition education. Level I identifies those who may need medical or nutrition attention or other preventive interventions. A more in-depth assessment may be the indicated intervention, and this screen should identify those who warrant closer scrutiny by a physician or RD. In this situation, the Level II Screen that includes more specific diagnostic information might be needed. The information obtained should increase the likelihood of detecting common nutrition problems. These problems may require the

intervention and management of a RD or other qualified health professional.¹⁵

In still other cases, home care companies may choose to develop a complete nutrition assessment protocol more closely related to pulmonary function that can be reviewed by a RD if needed.

SUMMARY

The caregiver can contribute significantly to achieving good nutrition for clients under his or her care. Signs and symptoms of nutrition problems or potential nutrition problems should be reported to appropriate team members, especially the RD.

The added energy expenditure resulting from the increased work of breathing in respiratory diseases only magnifies the importance of medical nutrition therapy (MNT). Application of fundamental metabolic principles, modified where necessary for the special circumstances of mechanical ventilation, will ensure optimal nutrition care.

In summary:

- All clients receiving respiratory care should undergo nutrition screening.
- Begin intensive nutrition support as needed after completing an assessment to determine preexisting malnutrition and to establish baseline parameters.
- Determine client's metabolic function by indirect calorimetry or by use of a proven formula such as Harris-Benedict or Ireton-Jones.
- Plan the MNT to achieve caloric repletion if client needs adjustments in calories, carbohydrate, and fat to minimize hypercapnia and to optimize respiratory quotient.
- Provide adequate protein for repletion and maintenance of body cell mass and muscle function.
- Provide fluids based on client's condition.
- Correct and maintain micronutrient, electrolyte, and acid-base balance.
- Feed client orally if possible or use the enteral route when the gastrointestinal tract is functional and aspiration risk can be minimized.
- Avoid overfeeding.
- Frequently reassess nutritional status, substrate utilization, micronutrient balance, and clinical progress.
- Modify the MNT prescription as needed.

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13

CHAPTER

Skin Integrity

Human skin is the largest organ in the body, covering more than 20 square feet in an average adult. Skin thickness varies from 1/50 inch over the eyelids to 1/3 inch on the palms of the hands and soles of the feet. The pH of the skin normally ranges from 4.5 to 5.5.¹

SKIN CONDITIONS

Skin Integrity

The loss of skin elasticity and moisture and reduced feeling in susceptible areas place the older client at risk for impaired skin integrity. Nutritional factors that contribute to skin breakdown include: protein deficiency creating a negative nitrogen balance; anemia inhibiting the formation of red blood cells; and dehydration causing dry, fragile skin. Dehydration can also result in an increase in the blood glucose level and slow the healing process.¹

When conducting a nutrition audit, note the temperature and color of the skin. Hot skin may indicate increased blood flow due to inflammation or infection. Cool or cold skin with a white or pale color usually indicates decreased blood flow and impaired circulation. Wrinkled, withered, or dry skin is a sign of dehydration. Taut and shiny skin may indicate edema. When assessing a client's skin, note that the presence of moisture contributes to the development of pressure ulcers. An incontinent client is at risk due to the skin's increased exposure to bacteria and toxins in the urine and feces. Excessive perspiration also may render a client at risk. Causes of excessive perspiration may be heavy clothing or bedding, or an elevated temperature. Breaks in the skin, as well as blemishes, rashes, lesions, and discolored areas, are warning signs of irritation or trauma and should also be noted. With advancing age comes decreased skin response to temperature, pain, and pressure. This affects the skin's elasticity and the healing process.²

Pressure Ulcers

Pressure ulcers usually occur over bony prominences and are graded or staged to classify the degree of tissue damage observed.

- **Stage I** — Nonblanchable erythema of intact skin; the heralding lesion of skin ulceration. *Note:* Reactive hyperemia can normally be expected to be present for one-half to three-fourths as long as the pressure-occluded blood flow to the area.² This should not be confused with a Stage I pressure ulcer.
- **Stage II** — Partial thickness skin loss involving epidermis and/or dermis. The ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater.
- **Stage III** — Full thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia. The ulcer presents clinically as a deep crater with or without undermining adjacent tissue.
- **Stage IV** — Full thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures (for example, tendon or joint capsule). *Note:* Undermining and sinus tracts may also be associated with Stage IV pressure ulcers.

Staging definitions recognize the following assessment limitations.

- Identification of Stage I pressure ulcers may be difficult in clients with darkly pigmented skin.
- When eschar is present, accurate staging of the pressure ulcer is not possible until the eschar has sloughed or the wound has been debrided.³

The following guidelines address the issue of pressure ulcers and the best practice guidelines for care.

Guideline 1: Clients at risk for pressure ulcers will be identified and assessed for risk factors.

- Immobility and inactivity are primary risk factors for pressure ulcer development.
- Diagnosis or conditions that increase risk for development of pressure ulcers may include urinary and/or fecal incontinence; peripheral vascular disease; cerebral vascular accident; diabetes mellitus; chronic obstructive pulmonary disease; sepsis; chronic or end-stage renal, liver, and/or heart disease; and disease-related immunosuppression, malnutrition, hip fractures, and spinal cord injury.

***INTENT:** The RD considers each disease diagnosed in relationship to the individual's nutrition intake. The disease may be a contributing factor to pressure ulcers.*

- Medical treatments and medications that may contribute to risk for pressure ulcers include antikinetic drugs (such as antidepressants and sleeping pills, drugs related to immunosuppression, steroid therapy, radiation therapy, chemotherapy, and renal dialysis).

***INTENT:** The RD, as a member of the health care team, reviews the nutritional side effects of medications.*

- Malnutrition, dehydration, or unintentional weight loss (greater than 5% in 1 month, 7.5% in 3 months, or 10% in 6 months), whether secondary to poor appetite or another disease process, places the client at risk for tissue breakdown and poor healing. Poor oral intake, a frequent precursor of malnutrition, can be caused by chewing or swallowing problems (ie, dysphagia), ill-fitting dentures, loss of ability to self-feed, restrictive diet orders, and/or polypharmacotherapy.

***INTENT:** The in-depth nutrition assessment targets these areas and a care plan is developed to address each problem area.*

- All assessments of pressure ulcer risk are documented using a validated risk assessment such as the Braden Scale (see Table 1).⁴

Guideline 2: Clients at risk for pressure ulcers will be monitored at appropriate intervals.

- The client's nutritional status is monitored at a minimum of every 3 months for those at mild nutrition risk and a minimum of monthly for those clients identified to be at high risk or malnourished. Some clients may require more frequent evaluation and documentation.

- Weight maintenance is one of the best indicators of nutritional adequacy.
- Laboratory values indicative of malnutrition include serum albumin below 3.5 g/dL; weight loss of more than 5% in 1 month, 7.5% in 3 months, or 10% in 6 months; serum transferrin level less than 180 mg/dL or prealbumin less than 17 mg/dL; hemoglobin less than 12 mg/dL and hematocrit less than 33%; serum cholesterol less than 160 mg/dL; and hydration parameters serum osmolality of less than 295 mOsm/L.
- Biochemical assessment data must be used with caution since it can be altered by medications and changes in metabolism. It is best to use the standards established by the laboratory that conducts the tests. Parameters for evaluating hydration status should include assessing urine output (I/Os), weight, BUN creatinine ratio >10:1, and skin turgor.

Guideline 3: Clients will receive appropriate care from a multidisciplinary team to prevent and treat pressure ulcers and to prevent infection.

- Adequate nutrition, including calories, protein, fluid, and vitamins/minerals, is provided to meet the client's needs.
- A daily multiple vitamin/mineral supplement meeting 100% RDA is given if caloric intake is

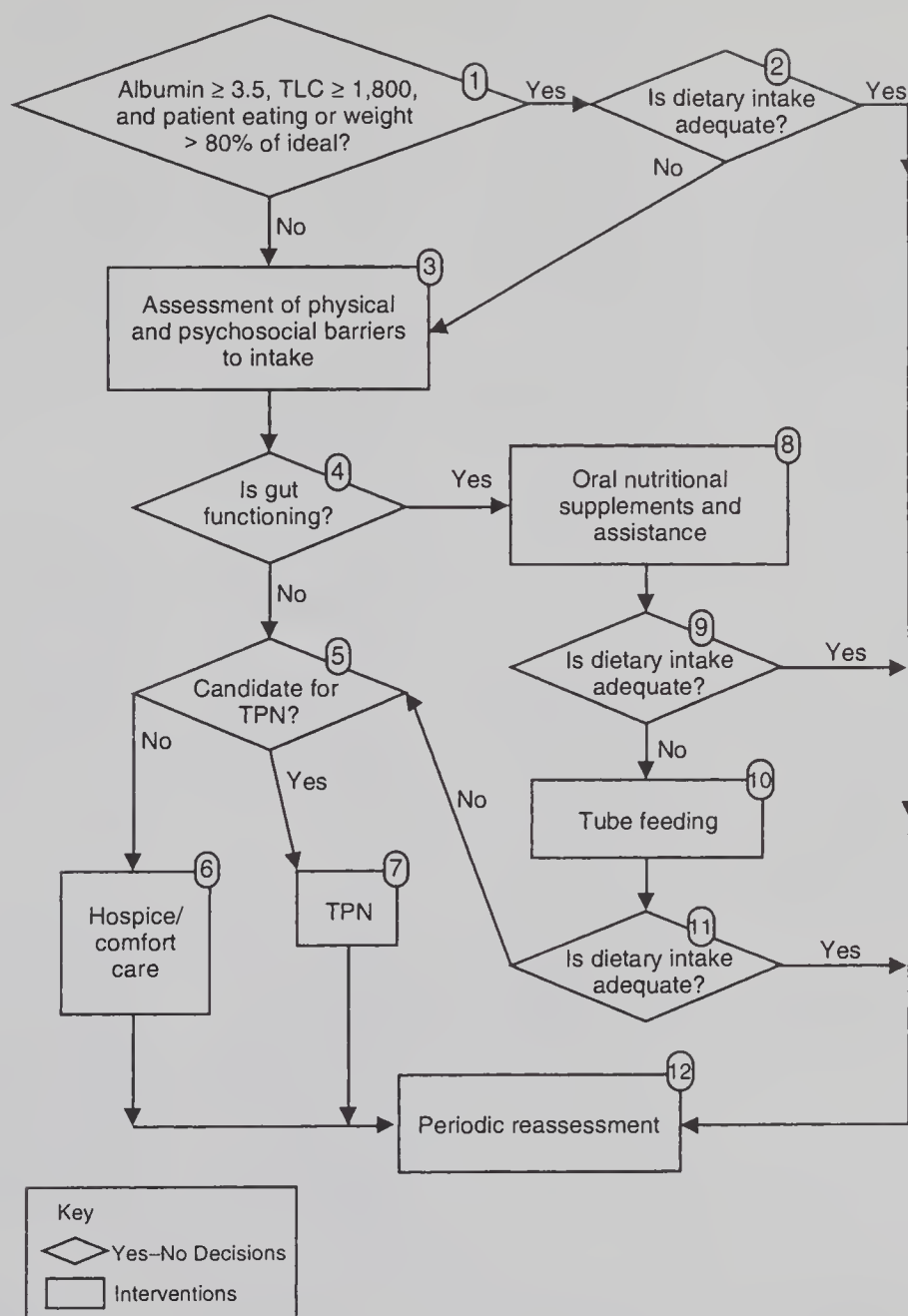
substantially below the required level or if vitamin and mineral deficiencies are confirmed by laboratory assessment. Supplement should not be greater than 10 times the RDA. Daily supplementation of 1 g to 2 g of vitamin C is recommended to promote wound healing in patients with vitamin C deficiency or suspected depleted stores.

Needs of Clients with Pressure Ulcers

- **Calorie Needs:** minimum of 30 to 35 kcal/kg body weight/day
- **Protein Needs:** 1.2 g to 1.5 g of protein/kg body weight/day
- **Fluid Needs:** minimum of 1,500 mL daily (unless medically contraindicated) or 30 mL/kg body weight/day (or an amount equal to kilocalorie requirements)

- Oral dietary intake, supplementation with food, and nutrition supplements are the first interventions. When dietary intake is inadequate, impractical, or impossible through oral intake alone, nutrition support (compatible with the desires of the client and/or family) is initiated to achieve a positive nitrogen balance. (See Figure 1.)

Figure 1
Nutrition Assessment and Support



Note: TLC = total lymphocyte count; TPN = total parenteral nutrition.

Source: Bergstrom N, Bennett MA, Carlson CE, et al. *Treatment of Pressure Ulcers*. Clinical Practice Guideline, No. 15. Rockville, Md: US Dept of Health and Human Services. Public Health Service, Agency for Health Care Policy and Research. AHCPR Publication No. 95-0652. December 1994.

Guideline 4: Pressure ulcers are systematically monitored for improvement or deterioration.

- Pressure ulcer healing is determined by the appearance of the replaced tissue.
- Pressure ulcer staging has been used inappropriately to denote pressure ulcer healing. There are no data that indicate a natural progression of an ulcer from Stage I to Stage IV, or a natural regression from Stage IV to Stage I during healing. The use of pressure ulcer stages in reverse

order is histologically incorrect because the original tissue layers destroyed by a pressure ulcer are not replaced with the same kinds of tissue. Instead, the ulcerated area is filled with granulation tissue composed primarily of endothelial cells, fibroblasts, and an extracellular matrix produced by fibroblasts. Stage IV and Stage III pressure ulcers progress to scar, which is primarily collagen that never possesses the characteristics of unbroken skin.

TABLE 1: BRADEN SCALE FOR PREDICTING PRESSURE SORE RISK

Patient's Name:		Evaluator's Name:		Date of Assessment:					
Sensory perception Ability to respond meaningfully to pressure-related discomfort	1. Completely limited Unresponsive (does not moan, flinch, or gasp) to painful stimuli due to diminished level of consciousness or sedation. OR Limited ability to feel pain over most of body surface.	2. Very limited Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness. OR Has sensory impairment which limits the ability to feel pain or discomfort over one-half of the body.	3. Slightly limited Responds to verbal commands but cannot always communicate discomfort or need to be turned. OR Has some sensory impairment which limits ability to feel pain or discomfort in one or two extremities.	4. No impairment Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.					
Moisture Degree to which skin is exposed to moisture	1. Constantly moist Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	2. Moist Skin is often but not always moist. Linen must be changed at least once a shift.	3. Occasionally moist Skin is occasionally moist, requiring an extra linen change approximately once a day.	4. Rarely moist Skin is usually dry. Linen requires changing only at routine intervals.					
Activity Degree of physical activity	1. Bedfast Confined to bed.	2. Chairfast Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	3. Walks occasionally Walks occasionally during day but for very short distances with or without assistance. Spends majority of each shift in bed or chair.	4. Walks frequently Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.					
Mobility Ability to change and control body position	1. Completely immobile Does not make even slight changes in body or extremity position without assistance.	2. Very limited Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	3. Slightly limited Makes frequent though slight changes in body or extremity position independently.	4. No limitations Makes major and frequent changes in position without assistance.					

continued

TABLE 1: BRADEN SCALE FOR PREDICTING PRESSURE SORE RISK

Nutrition	1. Very poor	2. Probably inadequate	3. Adequate	4. Excellent				
Usual food intake pattern	Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats two servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement. <i>OR</i> Is NPO* and/or maintained on clear liquids or IV** for more than 5 days.	Rarely eats a complete meal and generally eats only about 1/2 of any food offered. Protein intake includes only three servings of meat or dairy products per day. Occasionally will take a dietary supplement. <i>OR</i> Receives less than optimum amount of liquid diet or tube feeding.	Eats over half of most meals. Eats a total of four servings of protein (meat, dairy products) each day. Occasionally will refuse a meal, but will usually take a supplement if offered. <i>OR</i> Is on a tube feeding or TPN† regimen which probably meets most nutrition needs.	Eats most of every meal. Never refuses a meal. Usually eats a total of four or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.				
Friction and Shear	1. Problem Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractions, or agitation leads to almost constant friction.	2. Potential problem Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	3. No apparent problem Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.					
* NPO: Nothing by mouth				TOTAL SCORE				

** IV: Intravenously

† TPN: Total parenteral nutrition

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- The National Pressure Ulcer Advisory Panel (NPUAP) developed the Pressure Ulcer Scale for Healing (PUSH). (See *Boxes 1* and *2*.) This tool gives a numeric score that indicates change in an ulcer over time and includes length and width, exudate amount, and predominant tissue.
- Reimbursement is often compromised when pressure ulcers are documented as healing by regression to a Stage I or II. Air fluidized beds and other treatments and therapies required to promote healing are often denied on the basis of the current payment system.

Guideline 5: Documentation in the medical record is sufficient to track implementation and outcomes of care.

- Documentation in the medical record is consistent with care that is actually provided.

***INTENT:** The RD documents in the medical record on a routine basis [ie, calories, hydration, vitamin/mineral needs, weight status, and progress toward goals].*

- Weight-gaining techniques are used with the client requiring additional protein and calories for healing pressure ulcers. All aspects of nutrition care are documented and reviewed on a routine basis, at least monthly, until the wounds are healed. The RD needs to be a member of the wound care team. This team concept improves the quality of care for the client and ultimately the quality of life.⁵

Other skin ulcers which should not be confused with pressure ulcers include the following:

- **Venous Insufficiency (stasis):** defined as a disturbance in the forward flow of blood in the lower extremities that may progress to increased hydrostatic pressure, venous hypertension, and ultimately dermal ulceration
- **Arterial Insufficiency:** defined as insufficient arterial perfusion to an extremity or location
- **Peripheral Neuropathy:** defined as altered nerve function in the lower extremities; may involve diminished or absent sensation to touch, pain, or temperature; absence of sweating; foot deformities; and altered gait (weight-bearing)⁶

Table 2 is a quick reference to differentiate between the various types of ulcers.⁷

SUMMARY

A nutrition assessment of the client should include a physical assessment of the condition of the skin. The older adult is at risk for the development of pressure ulcers based on multiple risk factors including physical limitations, disease conditions, and medical treatments. In addition to pressure ulcers, the RD must evaluate other skin conditions such as wounds and circulation skin problems and develop nutrition interventions based on careful assessment of the skin.

BOX 1: PUSH Scale 2.1

Patient Name: _____

Patient ID#: _____

Ulcer Location: _____

Date: _____

DIRECTIONS:

Observe and measure the pressure ulcer. Categorize the ulcer with respect to surface area, exudate, and appearance. Record a subscore for each of these ulcer characteristics. Add the subscores to obtain the total score. A comparison of total scores measured over time provides an indication of the improvement or deterioration in pressure ulcer healing.

Length × Width	0 0 cm ²	1 < 1 cm ²	2 1-2 cm ²	3 2-5 cm ²	4 5-10 cm ²	5 > 10 cm ²	Subscore
Exudate Amount	0 None	1 Light	2 Moderate	3 Heavy			Subscore
Predominant Tissue	0 Closed	1 Epithelial tissue	2 Granulation tissue	3 Slough	4 Necrotic eschar		Subscore
							TOTAL SCORE

Length × Width: Measure the greatest length (head to toe) and the greatest width (side to side) using a centimeter ruler. Multiply these two measurements (length × width) to obtain an estimate of surface area in square centimeters (cm²). *Caveat:* Do not guess! Always use a centimeter ruler and always use the same method each time the ulcer is measured.

Exudate Amount: Estimate the amount of exudate (drainage) present after removal of the dressing and before applying any topical agent to the ulcer. Estimate the exudate (drainage) as none, light, moderate, or heavy.

Predominant Tissue: This refers to the type of tissue that occupies the majority of the ulcer bed. Divide the ulcer bed into four imaginary quadrants, each representing about 1/4 of the original ulcer surface. Estimate the portion or amount of each tissue type on the ulcer. Identify the predominant tissue type on the ulcer and record the predominant tissue type in the space provided.

- **Closed/resurfaced:** New tissue entirely covers the wound.
- **Epithelial tissue:** New pink or red skin that covers the original ulcer surface, growing in at the edges or in spots on the ulcer surface.
- **Granulation tissue:** Pink or beefy red tissue with a shiny, moist, granular appearance.
- **Slough:** Yellow or white tissue that adheres firmly to the wound bed or ulcer edges and may be either firmer or softer than surrounding skin.
- **Necrotic eschar:** Black or brown tissue that adheres firmly to the wound bed or ulcer edges and may be either firmer or softer than surrounding skin.

(Use a separate page for each pressure ulcer.)

Patient ID#: _____

Date:_____

Observe and measure pressure ulcers at regular intervals using the PUSH Scale.

Date and record PUSH Subscale and Total Scores on the Pressure Ulcer Healing Record below.

[illegible]

TABLE 2: CLINICAL FACT SHEET: QUICK ASSESSMENT OF LEG ULCERS

	Venous Insufficiency (stasis)	Arterial Insufficiency	Peripheral Neuropathy
Risk Factors	• Thrombosis of deep venous system • Lower extremity muscle weakness • Postphlebitic syndrome • Congestive heart failure • Pregnancy • Obesity • Trauma • Immobility • Family history • Previous history of lower extremity ulcers • Advanced age	• Diabetes • Smoking • Advanced age • Hyperlipidemia • Hypertension	• Diabetes • Smoking • Advanced age • Hansen's disease • Spinal cord lesion
History	• Previous deep vein thrombosis (DVT) and varicosities • Reduced mobility • Obesity • Vascular ulcers • Phlebitis • Traumatic injury • Congestive heart failure • Orthopedic procedures • Pain reduced by elevation	• Diabetes • Anemia • Arthritis • Increased pain with activity and/or elevation • Cardiovascular accident • Smoking • Intermittent claudication • Traumatic injury to extremity • Vascular procedures/ surgeries • Hypertension • Hyperlipidemia • Arterial disease	• Diabetes • Spinal cord injury • Hansen's disease • Relief of pain with ambulation • Paraesthesia of extremities
Appearance	• Color: base ruddy • Surrounding skin: erythema (venous dermatitis) and/or brown staining (hyperpigmentation) • Depth: usually shallow • Wound margins: irregular • Exudate: moderate to heavy • Edema: pitting or nonpitting; possible induration and cellulitis • Skin temp: normal; warm to touch • Granulation: frequently present • Infection: less common	• Color: base of wound pale/pallor on elevation; dependent rubor • Skin: shiny, taut, thin, dry; hair loss lower extremities; atrophy of subcutaneous tissue • Depth: deep • Wound margins: even • Exudate: minimal • Edema: variable • Skin temp: decreased/cold • Granulation tissue: rarely present • Infection: frequent (signs may be subtle) • Necrosis, eschar, gangrene may be present	• Color: Normal skin tones; trophic skin changes, fissuring and/or callus formation • Depth: variable • Wound margins: well defined • Exudate: variable • Edema: cellulitis, erythema, and induration common • Skin temp: warm • Granulation tissue: frequently present • Infection: frequent • Necrotic tissue variable, gangrene uncommon • Reflexes usually diminished • Altered gait; orthopedic deformities common

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Nutrition Assessment

CLIENT NUTRITION SCREENING

Nutrition screening is the process of identifying characteristics known to be associated with nutrition problems. Its purpose is to pinpoint individuals who are malnourished or at nutritional risk. Intervention takes place after screening occurs. The nutrition screen can be completed by a member of the health care team, such as the dietitian, dietetic technician, nurse, physician, dietary manager, or other qualified health care professionals.

The screening process has the following characteristics:

- May be completed in any setting (eg, via personal contact, on-site survey)
- Facilitates completion of early intervention goals
- Includes the collection of relevant data on risk factors and the interpretation of data for intervention/treatment
- Determines the need for nutrition assessment
- Is cost-effective¹

On a nutrition screen, a client having a high score is identified at risk for malnutrition. Numerous settings across the continuum of care can utilize the DETERMINE Your Nutritional Health (*Figure 1*) developed by the Nutrition Screening Initiative (NSI) to determine clients at nutritional risk. Using the DETERMINE, the NSI suggests that scores be placed in risk groups for intervention:

- Scores of 1 to 3 indicate low risk of poor nutritional status. The organization may want to distribute educational literature on nutrition and fitness.
- Scores of 3 to 4 indicate moderate risk. Clients may be directed to health education and wellness programs, selected health care professionals, or a case manager. It may be appropriate to direct clients to services such as Meals on

Wheels or counseling services. The checklist should be readministered in 3 months.

- Scores of 5 and above indicate a person of high nutritional risk who requires additional care.

Level I or II Screens (*Figures 2 and 3*) are used for clients who need further intervention. *Figure 4* (Nutrition Screen) is an example of a screen used to identify older adults at risk. The components of the screen are weighted to identify the degree of risk and provide a basis for identifying areas that require assessment by the RD/DTR.

THE NUTRITION ASSESSMENT

The nutrition assessment is a comprehensive approach, completed by the RD/DTR, that defines nutritional status using medical, nutrition, and medication histories; physical examination; anthropometric measurements; and laboratory data. “[It] includes the organization and evaluation of information to declare a professional judgement.”¹ Nutrition assessment includes interpretation of data from the screening process. The assessment process includes a review of data from other disciplines (ie, physical therapy and occupational therapy) that may affect the assessment process. Nutrition assessment precedes a care plan, intervention, and evaluation. *Figure 5* is a Nutrition Assessment Form.

The following risk factors and risk categories are guides to help the practitioner determine a client’s risk level.

Food and Nutrient Intake Patterns

Documentation of the client’s intake of foods and fluids is an essential part of the assessment process. *Figure 6*, the Food Acceptance Record, assists caregivers’ evaluation of the client’s food and fluid consumption. Recording the percentage of food consumed by food group may reveal a potential nutritional deficiency (eg, the client who refuses meat and protein foods and has pressure ulcers). Insufficient fluid intake can trigger

dehydration. The Food Acceptance Record alerts the dietetics professional to the factors that contributed to reduced intake. Interviews with the client and family will also contribute important information.

Figure 7, Food Intake Record, records a total percentage of the meal and the fluid intake by ounces. This type of record is useful to document replacements that are offered. Food replacements should be offered to clients at risk for malnutrition, such as clients eating less than 50% to 75% of the meal. It is important to document percentage of snacks that are offered.

Any problems encountered while chewing or swallowing foods, beverages, or medication are all risk factors that require attention on the assessment. The RD should examine the mouth for broken or missing teeth and swollen or bleeding gums which may pinpoint a vitamin C deficiency. A dry mouth with reduced saliva production may be a sign of dehydration or a result of medications (eg, bronchodilator, psychotropics, etc). Lesions in the mouth and sore or bleeding gums also affect oral intake.

Dental problems such as loose-fitting dentures may require the assistance of the social service director to contact the dentist and correct the problem. Carefully observe the client who is edentulous, has poor teeth, or has ill-fitting dentures before recommending a consistency alteration. Oral status includes evaluation of texture modification. A client who has difficulty swallowing may also require texture modification. The registered dietitian, speech and language pathologist, and occupational therapist should work as a team to evaluate the need for thickened liquids, texture modifications, and self-help feeding devices.

Sensory Impairment

Visual impairments can contribute to decreased food intake at meals. Interviewers should alert caregivers to give verbal cues for meal placement using the clock method. Decreased peripheral vision requires moving the food into the line of sight. Ask the client (not family or friends) how much help is needed. For example: Should meat be cut? Should bread be buttered? Should the location of the food on the plate be described? Many persons who have lost their sight have worked out solutions to locating their food and do not like being treated as if they cannot help themselves.

There are gradual declines in the senses of taste and smell with age.²⁶ Smoking may alter taste and smell, which may impair oral intake and decrease meal satisfaction. The sense of taste, although rarely completely lost, may also undergo change with age. Dental problems may contribute to mild dysgeusia or a chronic taste in the mouth. Studies suggest that the taste losses observed in old age may result more from changes in

receptors and channels in taste buds than from losses in the number of taste buds.⁷⁻¹⁰ Sweet and salty tastes decline first and food then tends to taste sour or bitter.

Individuals who experience difficulties with aspects of taste perception may suffer equivalent problems with perception of smell. The ability to identify common food odors may be impaired as well as the ability to discriminate foods.

Cognitive or Emotional Impairment

Depression is a common psychosocial problem that can often go undetected. Disinterest in cooking, shopping, and preparing food, often observed in the depressed person, contributes to functional decline. The decline is perpetuated by unfamiliar settings as the individual is transferred across the continuum of care from the least restrictive home care environment to extended care facilities.

The prevalence of cognitive impairment, clinical depression, depressive symptoms, the dementias, other psychiatric disorders, and psychological disturbances along with their potential impact on nutritional status are considerable.¹¹ Dementia has been associated with B₁₂ deficiency, and dementias and depression caused by metabolic disorders, drug toxicity, hypothyroidism, and confusion can often be associated with malnutrition.

Many of the drugs used to treat cognitive disorders, such as antidepressants, antipsychotics, antianxiety agents, and anticholinergics, have the potential to cause significant side effects. Increased or decreased appetite, nausea, dry mouth, dehydration, changes in bowel status, drowsiness, and anorexia are potential complications.

Is the client alert, able to voice food preferences and remember mealtimes? Has the client's thought process altered the ability to eat independently? Does the client display indications of paranoia related to food or meal service? A client may be forgetful but still have the ability to eat independently if prompted by the caregivers.

Constipation/Diarrhea

Constipation and diarrhea are both risk factors to address in a nutrition assessment. The use of over-the-counter laxatives is common in the older adult, and laxative abuse is widespread and can induce a state of malabsorption. Chronic diarrhea can lead to dehydration and weight loss which increase the risk for malnutrition. When constipation progresses to fecal impaction, associated symptoms include anorexia, confusion, and fecal incontinence, and thus impaction itself predisposes to dehydration and to further diminution of nutritional status.

Figure 1

DETERMINE Your Nutritional Health

The Nutrition Checklist is based on the Warning Signs described below. Use the word DETERMINE to remind you of the Warning Signs.

DISEASE

Any disease, illness or chronic condition which causes you to change the way you eat, or makes it hard for you to eat, puts your nutritional health at risk. Four out of five adults have chronic diseases that are affected by diet. Confusion or memory loss that keeps getting worse is estimated to affect one out of five or more of older adults. This can make it hard to remember what, when or if you've eaten. Feeling sad or depressed, which happens to about one in eight older adults, can cause big changes in appetite, digestion, energy level, weight and well-being.

EATING POORLY

Eating too little and eating too much both lead to poor health. Eating the same foods day after day or not eating fruit, vegetables, and milk products daily will also cause poor nutritional health. One in five adults skip meals daily. Only 13% of adults eat the minimum amount of fruit and vegetables needed. One in four older adults drink too much alcohol. Many health problems become worse if you drink more than one or two alcoholic beverages per day.

TOOTH LOSS/ MOUTH PAIN

A healthy mouth, teeth and gums are needed to eat. Missing, loose or rotten teeth or dentures which don't fit well or cause mouth sores make it hard to eat.

ECONOMIC HARDSHIP

As many as 40% of older Americans have incomes of less than \$6,000 per year. Having less--or choosing to spend less--than \$25-30 per week for food makes it very hard to get the foods you need to stay healthy.

REDUCED SOCIAL CONTACT

One-third of all older people live alone. Being with people daily has a positive effect on morale, well-being and eating.

MULTIPLE MEDICINES

Many older Americans must take medicines for health problems. Almost half of older Americans take multiple medicines daily. Growing old may change the way we respond to drugs. The more medicines you take, the greater the chance for side effects such as increased or decreased appetite, change in taste, constipation, weakness, drowsiness, diarrhea, nausea, and others. Vitamins or minerals when taken in large doses act like drugs and can cause harm. Alert your doctor to everything you take.

INVOLUNTARY WEIGHT LOSS/GAIN

Losing or gaining a lot of weight when you are not trying to do so is an important warning sign that must not be ignored. Being overweight or underweight also increases your chance of poor health.

NEEDS ASSISTANCE IN SELF CARE

Although most older people are able to eat, one of every five have trouble walking, shopping, buying and cooking food, especially as they get older.

ELDER YEARS ABOVE AGE 80

Most older people lead full and productive lives. But as age increases, risk of frailty and health problems increase. Checking your nutritional health regularly makes good sense.



The Nutrition Screening Initiative, 2626 Pennsylvania Avenue, NW, Suite 301, Washington, DC 20037

The Nutrition Screening Initiative is funded in part by a grant from Ross Laboratories, a division of Abbott Laboratories.

continued

Figure 1

DETERMINE Your Nutritional Health

The Warning Signs of poor nutritional health are often overlooked. Use this checklist to find out if you or someone you know is at nutritional risk.

Read the statements below. Circle the number in the yes column for those that apply to you or someone you know. For each yes answer, score the number in the box. Total your nutritional score.

DETERMINE YOUR NUTRITIONAL HEALTH

	YES
I have an illness or condition that made me change the kind and/or amount of food I eat.	2
I eat fewer than 2 meals per day.	3
I eat few fruits or vegetables, or milk products.	2
I have 3 or more drinks of beer, liquor or wine almost every day.	2
I have tooth or mouth problems that make it hard for me to eat.	2
I don't always have enough money to buy the food I need.	4
I eat alone most of the time.	1
I take 3 or more different prescribed or over-the-counter drugs a day.	1
Without wanting to, I have lost or gained 10 pounds in the last 6 months.	2
I am not always physically able to shop, cook and/or feed myself.	2
TOTAL	

Total Your Nutritional Score. If it's —

- 0-2** **Good!** Recheck your nutritional score in 6 months.
- 3-5** **You are at moderate nutritional risk.** See what can be done to improve your eating habits and lifestyle. Your office on aging, senior nutrition program, senior citizens center or health department can help. Recheck your nutritional score in 3 months.
- 6 or more** **You are at high nutritional risk.** Bring this checklist the next time you see your doctor, dietitian or other qualified health or social service professional. Talk with them about any problems you may have. Ask for help to improve your nutritional health.

These materials developed and distributed by the Nutrition Screening Initiative, a project of:



AMERICAN ACADEMY
OF FAMILY PHYSICIANS



THE AMERICAN
DIETETIC ASSOCIATION



NATIONAL COUNCIL
ON THE AGING, INC.

Remember that warning signs suggest risk, but do not represent diagnosis of any condition. Turn the page to learn more about the Warning Signs of poor nutritional health.

Figure 2
Level I Screen

Level 1 Screen

Body Weight

Measure height to the nearest inch and weight to the nearest pound. Record the values below and mark them on the Body Mass Index (BMI) scale to the right. Then use a straight edge (ruler) to connect the two points and circle the spot where this straight line crosses the center line (body mass index). Record the number below.

Healthy older adults should have a BMI between 24 and 27.

Height (in): _____

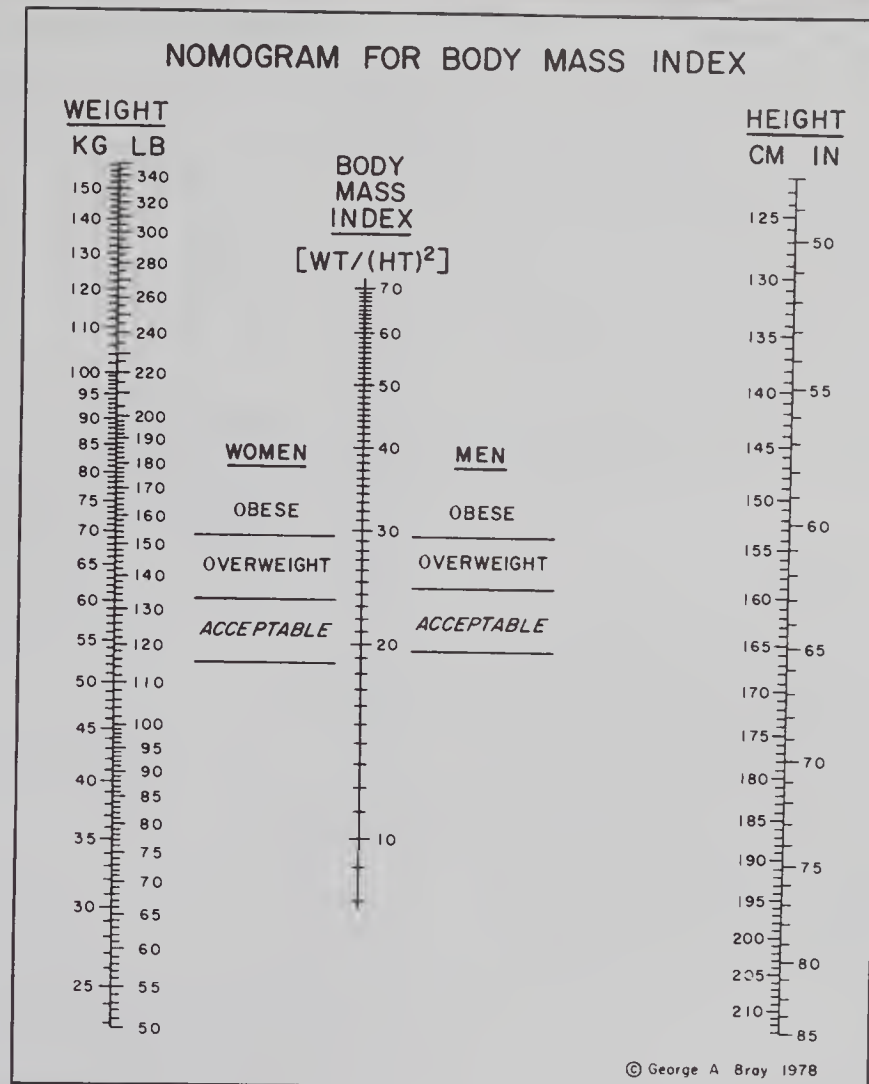
Weight (lbs): _____

Body Mass Index: _____
(number from center column)

Check any boxes that are true for the individual:

- ☐ Has lost or gained 10 pounds (or more) in the past 6 months.
- ☐ Body mass index <24
- ☐ Body mass index >27

For the remaining sections, please ask the individual which of the statements (if any) is true for him or her and place a check by each that applies.



Eating Habits

- ☐ Does not have enough food to eat each day
- ☐ Usually eats alone
- ☐ Does not eat anything on one or more days each month
- ☐ Has poor appetite
- ☐ Is on a special diet
- ☐ Eats vegetables two or fewer times daily
- ☐ Eats milk or milk products once or not at all daily
- ☐ Eats fruit or drinks fruit juice once or not at all daily
- ☐ Eats breads, cereals, pasta, rice, or other grains five or fewer times daily
- ☐ Has difficulty chewing or swallowing
- ☐ Has more than one alcoholic drink per day (if woman); more than two drinks per day (if man)
- ☐ Has pain in mouth, teeth, or gums

Living Environment

- ☐ Lives on an income of less than \$6000 per year (per individual in the household)
- ☐ Lives alone
- ☐ Is housebound
- ☐ Is concerned about home security
- ☐ Lives in a home with inadequate heating or cooling
- ☐ Does not have a stove and/or refrigerator
- ☐ Is unable or prefers not to spend money on food (<\$25-30 per person spent on food each week)

Functional Status

Usually or always needs assistance with (check each that apply):

- ☐ Bathing
- ☐ Walking or moving about
- ☐ Dressing
- ☐ Traveling (outside the home)
- ☐ Grooming
- ☐ Preparing food
- ☐ Toileting
- ☐ Shopping for food or other necessities
- ☐ Eating

Figure 3

Level II Screen

Level II Screen

Complete the following screen by interviewing the patient directly and/or by referring to the patient chart. If you do not routinely perform all of the described tests or ask all of the listed questions, please consider including them but do not be concerned if the entire screen is not completed. Please try to conduct a minimal screen on as many older patients as possible, and please try to collect serial measurements, which are extremely valuable in monitoring nutritional status. Please refer to the manual for additional information.

Anthropometrics

Measure height to the nearest inch and weight to the nearest pound. Record the values below and mark them on the Body Mass Index (BMI) scale to the right. Then use a straight edge (paper, ruler) to connect the two points and circle the spot where this straight line crosses the center line (body mass index). Record the number below; healthy older adults should have a BMI between 24 and 27; check the appropriate box to flag an abnormally high or low value.

Height (in): _____

Weight (lbs): _____

Body Mass Index

(weight/height²): _____

Please place a check by any statement regarding BMI and recent weight loss that is true for the patient.

- ☐ Body mass index <24
- ☐ Body mass index >27
- ☐ Has lost or gained 10 pounds (or more) of body weight in the past 6 months

Record the measurement of mid-arm circumference to the nearest 0.1 centimeter and of triceps skinfold to the nearest 2 millimeters.

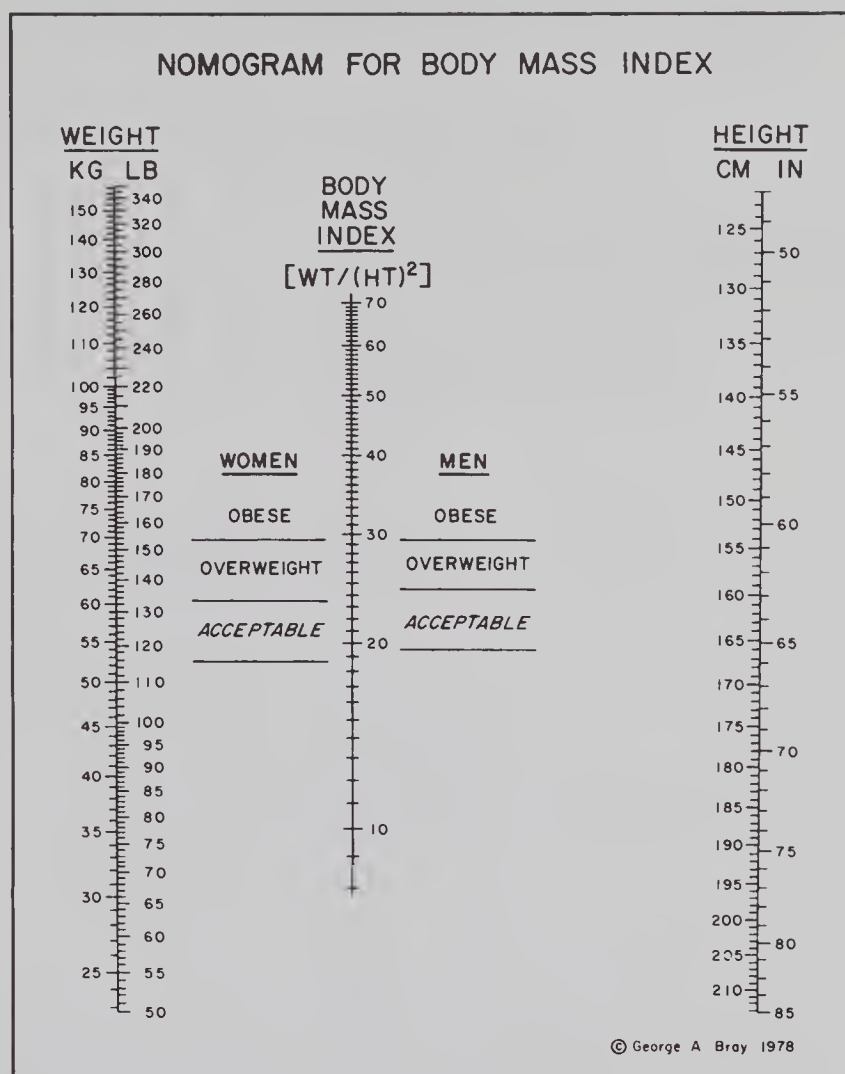
Mid-Arm Circumference (cm): _____

Triceps Skinfold (mm): _____

Mid-Arm Muscle Circumference (cm): _____

Refer to the table and check any abnormal values:

- ☐ Mid-arm muscle circumference <10th percentile



☐ Triceps skinfold <10th percentile

☐ Triceps skinfold >95th percentile

Note: mid-arm circumference (cm) - {0.314 x triceps skinfold (mm)} = mid-arm muscle circumference (cm)

For the remaining sections, please place a check by any statements that are true for the patient.

Laboratory Data

- ☐ Serum albumin below 3.5 g/dl
- ☐ Serum cholesterol below 160 mg/dl
- ☐ Serum cholesterol above 240 mg/dl

Drug Use

- ☐ Three or more prescription drugs, OTC medications, and/or vitamin/mineral supplements daily

continued

Figure 3
Level II Screen

Clinical Features

Presence of (check each that apply):

- ☐ Problems with mouth, teeth, or gums
- ☐ Difficulty chewing
- ☐ Difficulty swallowing
- ☐ Angular stomatitis
- ☐ Glossitis
- ☐ History of bone pain
- ☐ History of bone fractures
- ☐ Skin changes (dry, loose, nonspecific lesions, edema)

Percentile	Men		Women	
	55-65 y	65-75 y	55-65 y	65-75 y
<i>Arm circumference (cm)</i>				
10th	27.3	26.3	25.7	25.2
50th	31.7	30.7	30.3	29.9
95th	36.9	35.5	38.5	37.3
<i>Arm muscle circumference (cm)</i>				
10th	24.5	23.5	19.6	19.5
50th	27.8	26.8	22.5	22.5
95th	32.0	30.6	28.0	27.9
<i>Triceps skinfold (mm)</i>				
10th	6	6	16	14
50th	11	11	25	24
95th	22	22	38	36

From: Frisanco AR. New norms of upper limb fat and muscle areas for assessment of nutritional status. Am J Clin Nutr 1981; 34:2540-2545. © 1981 American Society for Clinical Nutrition.

Eating Habits

- ☐ Does not have enough food to eat each day
- ☐ Usually eats alone
- ☐ Does not eat anything on one or more days each month
- ☐ Has poor appetite
- ☐ Is on a special diet
- ☐ Eats vegetables two or fewer times daily
- ☐ Eats milk or milk products once or not at all daily
- ☐ Eats fruit or drinks fruit juice once or not at all daily
- ☐ Eats breads, cereals, pasta, rice, or other grains five or fewer times daily
- ☐ Has more than one alcoholic drink per day (if woman); more than two drinks per day (if man)

Living Environment

- ☐ Lives on an income of less than \$6000 per year (per individual in the household)
- ☐ Lives alone
- ☐ Is housebound
- ☐ Is concerned about home security

- ☐ Lives in a home with inadequate heating or cooling
- ☐ Does not have a stove and/or refrigerator
- ☐ Is unable or prefers not to spend money on food (<\$25-30 per person spent on food each week)

Functional Status

Usually or always needs assistance with (check each that apply):

- ☐ Bathing
- ☐ Dressing
- ☐ Grooming
- ☐ Toileting
- ☐ Eating
- ☐ Walking or moving about
- ☐ Traveling (outside the home)
- ☐ Preparing food
- ☐ Shopping for food or other necessities

Mental/Cognitive Status

- ☐ Clinical evidence of impairment, e.g. Folstein < 26
- ☐ Clinical evidence of depressive illness, e.g. Beck Depression Inventory > 15, Geriatric Depression Scale > 5

Patients in whom you have identified one or more major indicator (see pg 2) of poor nutritional status require immediate medical attention; if minor indicators are found, ensure that they are known to a health professional or to the patient's own physician. Patients who display risk factors (see pg 2) of poor nutritional status should be referred to the appropriate health care or social service professional (dietitian, nurse, dentist, case manager, etc.).

Figure 4
Nutrition Screen

NUTRITION SCREEN	Points
Age _____ > 65 (1 point) > 75 (2 points) 80+ (3 points)	
Eating Habits - 1 point each ☐ Usually eats alone ☐ Has more than one alcoholic drink per day (women); more than two per day (men) ☐ Eats fewer than two meals per day ☐ Eats 1 serving of fruit/fruit juice per day ☐ Eats 1 serving of milk or milk products per day ☐ Eats 2 servings of vegetables per day ☐ Eats 1 serving of meat or poultry per day	
Health History - 1 point each Appetite at home: ☐ Fair ☐ Poor ☐ Difficulty chewing ☐ Difficulty swallowing ☐ Constipation ☐ Diarrhea ☐ Nausea ☐ Vomiting ☐ Indigestion ☐ Declined sense of taste ☐ Missing teeth ☐ Poor-fitting dentures ☐ Other _____	
Height/Weight History Height _____ Usual body weight _____ Current weight _____ % Change in 30 days _____ ☐ Body Mass Index < 24 or > 27 (3 points) ☐ > 10% in 6 months (3 points) ☐ > 5% in 30 days (3 points)	
Functional Status - 2 points each Usually or always needs assistance with: ☐ Eating ☐ Walking or moving about ☐ Traveling outside the home ☐ Preparing food ☐ Shopping for food	
Diagnosis - 3 points each ☐ Alcoholism ☐ Alzheimer's/Dementia ☐ Cancer ☐ Cardiovascular disease ☐ Chronic obstructive pulmonary disease (COPD)/Emphysema	

continued

Figure 4
Nutrition Screen

NUTRITION SCREEN	Points						
Diagnosis (continued) - 3 points each ☐ Depression ☐ Diabetes ☐ Dysphagia ☐ GI bleed ☐ Liver disease/Cirrhosis ☐ Malnutrition ☐ Osteoporosis ☐ Renal disease ☐ Sepsis ☐ Urinary tract infection							
Laboratory Data - 2 points each ☐ Serum albumin < 3.5 g/dL ☐ Total protein < 6.0 g/dL ☐ Cholesterol < 160 mg/dL ☐ Prealbumin < 17 mg/dL							
Medications - 2 points each ☐ Takes 3 or more prescribed or over-the-counter drugs per day ☐ Takes vitamin or mineral supplement daily							
Mental/Cognitive Status - 2 points each ☐ Clinical evidence of impairment, eg, Folstein < 26 ☐ Clinical evidence of depressive illness, eg, Beck Depression Inventory > 15 Geriatric Depression Scale > 5							
TOTAL POINTS							
Determine Nutritional Risk <table border="0"> <tr> <td>Low Risk</td> <td>5 or less</td> </tr> <tr> <td>Moderate</td> <td>6 - 15</td> </tr> <tr> <td>High Risk</td> <td>16 or above</td> </tr> </table>	Low Risk	5 or less	Moderate	6 - 15	High Risk	16 or above	
Low Risk	5 or less						
Moderate	6 - 15						
High Risk	16 or above						

Figure 5

Nutrition Assessment Form

NUTRITION ASSESSMENT			
NAME _____		ADMISSION DATE _____ ROOM _____	
DOB _____	Ht _____	Sex: M / F	Diet Order _____
Wt _____	lbs ÷ 2.2 = _____	kg	Food Allergies/Sensitivities _____
Body Mass Index _____		Cultural/Religious Preferences _____	
Frame Size:	Sm	Med	Lg
PHYSICIAN _____		Tube Feeding _____	
DIAGNOSIS _____		Supplement Order _____	
USUAL BODY WEIGHT _____			
IDEAL BODY WEIGHT RANGE _____ + _____ = _____ ÷ 2 = _____ DESIRABLE BODY WEIGHT			
PERCENT WEIGHT GAIN _____ % or PERCENT WEIGHT LOSS _____ %			
EXPLAIN _____			
DEGREE OF SELF-HELP		COGNITIVE PATTERN	
	Independent		Resident alert — information reliable
	Needs tray set-up		Resident somewhat confused — Check information with family and/or nursing.
	Needs supervision		Resident unable to relate reliable information; all information obtained from family/nursing staff.
MOBILITY		VISION	
	Total assistance		Blind
	Needs firm encouragement		Glasses
	Partial assistance		Impaired
	Enteral feeding		Side vision problem — leaves food on one side of plate
	Needs self-help feeding device; Type: _____		Adequate — no problem
	Parenteral / IV		
MOBILITY		ORAL STATUS	
	Pacing/wandering		Dentures: _____ Full _____ Partial _____ Loose _____ Will not wear
	Cane/walker		
	Wheelchair		
	Geri chair		Few teeth
	Independent		Poor condition
SKIN CONDITION			Edentulous
	Stasis ulcer		Pockets food
	Pressure ulcer		Difficulty chewing
	_____ Stage I _____ Stage III		Difficulty swallowing
	_____ Stage II _____ Stage IV		Mouth pain/inflamed gums
Comments:			Own teeth — good condition

continued

Figure 5**Nutrition Assessment Form**

COMMUNICATION BARRIERS		OTHER FACTORS	
	Hearing aid		Nausea/vomiting
	Signs/gestures		Constipation
	Writes to express needs		Diarrhea
	Poor hearing/hard-of-hearing		Hiatal hernia
	Adequate — no problems		Gastric distress
Comments:		Comments:	
FLUID/HYDRATION		LABORATORY VALUES (Specify values.)	
	Hydrated		BUN
	Edema		Cholesterol
	Dehydrated		Glucose
	Ascites		Hgb A1C
ESTIMATED ENERGY/PROTEIN/FLUID NEEDS			Albumin
	BEE		Total protein
	Activity factor		Sodium
	Injury factor		Potassium
	Total calories		Hemoglobin
	Protein (g)		Hematocrit
	Fluids (cc)		
MOST MEALS			
	Leaves 25% of food on plate		
	% food consumed		
	cc fluid taken		
	Accepts all food groups		
	Groups omitted		
MEDICATIONS WITH NUTRITIONAL IMPLICATION (nutritionally pertinent)			
TYPE OF MEDICATION (List medications by name under specific type.)			
Antacids:	Antihypertensives:	Hypoglycemia agents:	
Antibiotics:	Cardiac glycosides:	Laxatives:	
Anticonvulsants:	Diuretics:	Psychotropic drugs:	

Source: MEP Healthcare Dietary Services, Inc. Evansville, Ind. Reprinted with permission.

Dietitian's Summary:

Registered Dietitian _____ Date _____
Dietary Manager / Food Service Director _____ Date _____

Figure 6

Food Acceptance Record

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
B R E A K F A S T	Milk (oz)																															
	Meat: egg/ cheese/entree																															
	Vegetable: fruit/juice																															
	Bread: grain/ rice/pasta																															
	Beverage (oz)																															
	Initials																															
D I N N E R	Milk (oz)																															
	Meat: egg/ cheese/entree																															
	Vegetable: fruit/juice																															
	Bread: grain/ rice/pasta																															
	Beverage (oz)																															
	Initials																															
S U P P E R	Milk (oz)																															
	Meat: egg/ cheese/entree																															
	Vegetable: fruit/juice																															
	Bread: grain/ rice/pasta																															
	Beverage (oz)																															
	Initials																															
S U P P L E M E N T	Midmorning																															
	Midafternoon																															
	HS																															

Resident Food Intake

Guidelines for determining meal percentages. Follow schedule outlined below:

Milk or juice	10%	Milk	10%
Meat	30%	Meat or egg	30%
Vegetable or salad	10%	Juice	10%
Bread	10%	Cereal	30%
Potato or substitute	20%	Toast or substitute	20%
Dessert	20%		

Fluid Intake

Small glass - 120 mL/4 oz

Large glass - 240 mL/8 oz

Cup - 180 mL/6 oz

Dish of ice cream or gelating dessert -
120 mL/4 oz

Bowl of soup - 180 mL/6 oz

If an item is eaten less than 1/4 of amount served - no credit shall be given.

If an item is eaten more than 3/4 of amount served - full credit shall be given.

Add all item percentages to determine total meal intake.

NAME _____ Month/year _____

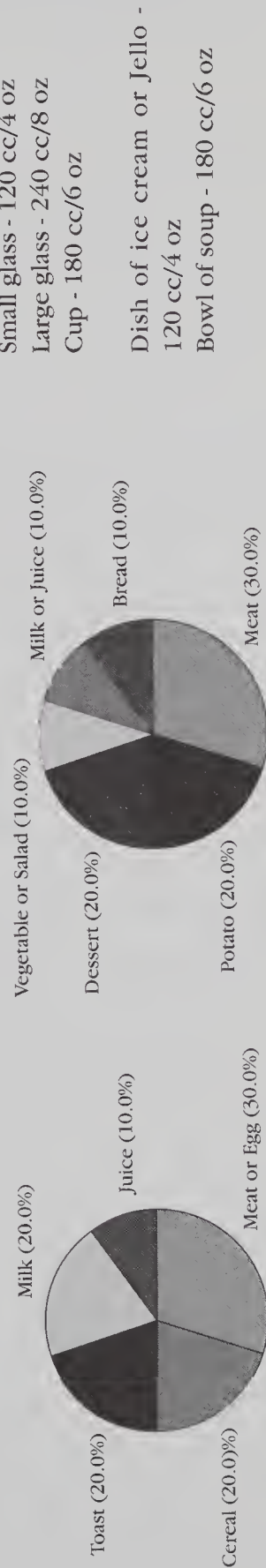
Source: Adapted from MEP Healthcare Dietary Services, Inc. Evansville, Ind. Reprinted with permission.

Figure 7
Food Intake Record

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Breakfast																															
Fluids (oz)																															
Replacement																															
A.M. snack																															
Lunch																															
Fluids (oz)																															
Replacement																															
P.M. Snack																															
Supper																															
Fluids (oz)																															
Replacement																															
H.S. Snack																															
Replacement																															

Replacement noted for insulin, calorie-controlled diabetics, and consumption of 50% or less

Guidelines for Determining Meal Percentages Follow schedule outlined below:



FLUID INTAKE

- Small glass - 120 cc/4 oz
- Large glass - 240 cc/8 oz
- Cup - 180 cc/6 oz
- Dish of ice cream or Jello - 120 cc/4 oz
- Bowl of soup - 180 cc/6 oz

An item is eaten less than 1/4 of amount served - no credit shall be given.

Therapeutic Diets

Restricted diets can also pose nutrition problems especially for the older adult client who has enjoyed eating a variety of food. (See Chapter 5.) A limitation of nutrients such as sodium or fat often leads to a reduction in intake, leading to weight loss.

Feeding Limitations

Review of the occupational therapist's and speech language pathologist's consultations assists the RD in assessing the physical limitations (eg, inability to drink from a cup, need to use special utensils) that play a role in the nutritional status of the client. (See Chapter 15.)

Physical Functioning

Determine whether the client requires limited, extensive, or no assistance with meals and snacks. Clients with physical limitations from conditions such as arthritis or strokes commonly need some assistance in opening condiment packets or milk containers, since these procedures involve hand-eye coordination. Physical concerns that affect eating and the ability to handle feeding utensils are paralysis, lack of hand dexterity, or contracture of the hands. Paralysis can result in chewing or swallowing problems that require modifying the texture of the food. Some clients have the stamina to feed themselves breakfast and the noon meal but tire before the evening meal. (See Chapter 15.)

Psychological/Social Factors

This potential risk category, psychological and/or social factors, includes history or evidence of the following risk factors:

- Literacy level or language barriers
- Cultural factors that alter intake of desired nutrients, calories, or food groups
- Religious beliefs that alter intake of desired nutrients, calories, or food groups
- Emotional disturbances (eg, depression, stress) with associated feeding problems
- Caregiver/social support system
- Social isolation (motivational level for self-care)
- Eating or feeding disorders (eg, bulimia, early satiety, autism, rapid pace of eating)
- Limited resources for food preparation or limited access to transportation to obtain food
- Substance/alcohol abuse
- Limited or low income (eg, below poverty level)
- Limited ability/use/knowledge of normal nutrition, food preparation, food safety, and community resources
- Lack of ability to communicate needs (eg, dyspraxia)

Additional factors that the dietetics professional includes in the assessment are a review of the previous living environment and the factors that impact nutritional status as the client moves across the continuum of care. Data-gathering may include input from all caregivers.

Food Preference, *Figure 8*, can be used to gather data that help determine food choices. This simple form is useful in any setting. *Figure 9* outlines characteristics of selected ethnic diets.¹²

Figure 8
Food Preferences

FOOD PREFERENCES					
	YES	NO		YES	NO
MILK			VEGETABLES		
Sweet	_____	_____	Asparagus	_____	_____
Buttermilk	_____	_____	Beets	_____	_____
Chocolate	_____	_____	Broccoli	_____	_____
FRUITS			Brussels sprouts	_____	_____
Apples	_____	_____	Black-eyed peas	_____	_____
Applesauce	_____	_____	Cabbage	_____	_____
Apricots	_____	_____	Carrots	_____	_____
Grapefruit	_____	_____	Cauliflower	_____	_____
Pears	_____	_____	Corn	_____	_____
Pineapple	_____	_____	Cucumbers	_____	_____
Plums	_____	_____	Green beans	_____	_____
Prunes/juice	_____	_____	Lettuce	_____	_____
Peaches	_____	_____	Lima beans	_____	_____
Bananas	_____	_____	Navy beans	_____	_____
Fruit cocktail	_____	_____	Onions	_____	_____
Watermelon	_____	_____	Peas	_____	_____
Cantaloupe	_____	_____	Potatoes	_____	_____
Oranges	_____	_____	Pumpkin	_____	_____
Orange juice	_____	_____	Sauerkraut	_____	_____
BREADS/CEREAL			Squash	_____	_____
Cornflakes	_____	_____	Spinach	_____	_____
Branflakes	_____	_____	Tomatoes (canned)	_____	_____
Oatmeal	_____	_____	(fresh)	_____	_____
Rice	_____	_____	Yams/sweet potatoes	_____	_____
Cream of Wheat	_____	_____	SALAD DISHES		
Spaghetti	_____	_____	Lettuce	_____	_____
Macaroni	_____	_____	Coleslaw	_____	_____
Biscuits	_____	_____	Cottage cheese	_____	_____
Cornbread	_____	_____	American cheese	_____	_____
Pancakes/ French Toast	_____	_____	Gelatin	_____	_____
SOUPS			Cranberry sauce	_____	_____
Chili	_____	_____	Macaroni salad	_____	_____
Potato	_____	_____	Potato chips	_____	_____
Tomato	_____	_____	Pea salad	_____	_____
Vegetable	_____	_____	Mixed bean salad	_____	_____
Beef	_____	_____	MEATS		
Bacon	_____	_____	Eggs, favorite style	_____	_____
Bean	_____	_____	Sausage	_____	_____
Other	_____	_____	Wieners	_____	_____
			Chicken (baked)	_____	_____
			Ham	_____	_____
			Turkey	_____	_____
			Pork chop/Pork roast	_____	_____
			Roast beef	_____	_____
			Hamburger	_____	_____
			Meat loaf	_____	_____
			Fish (baked)	_____	_____
			(fried)	_____	_____
			Tuna	_____	_____
			Liver	_____	_____
			Casseroles	_____	_____
			Other:	_____	_____

NAME _____ ROOM # _____

Figure 9
Characteristics of Selected Ethnic Diets

HISPANIC AMERICANS FROM CUBA, HAITI, PUERTO RICO

Include:

- Steamed white rice; wheat breads
- Starchy vegetables (beans, cassavas, yuccas); plantains; green peppers; tomatoes; garlic
- Dried, salted fish; chicken; pork
- Lard; olive oil; sugar; jams and jellies; sweet pastries; sugared fruit juices; coffee

Exclude:

- Green, leafy vegetables
- Milk as a beverage for adults
- Fish other than dried and salted

HISPANIC AMERICANS FROM MEXICO, CENTRAL AMERICA

Include:

- Steamed rice, corn products such as tortillas
- Many varieties of beans; chili peppers; tomatoes; mangoes; prickly pear fruit; potatoes
- Meat and sausages; fish; poultry; eggs
- Lard; chocolate and coffee drinks; cakes; pastries

Exclude:

- Green, leafy vegetables; yellow vegetables
- Milk as a beverage for adults

**BLACK AMERICANS FROM WEST INDIES, CENTRAL OR SOUTH AMERICA,
 AND RECENT AFRICAN IMMIGRANTS**

Include:

- Millet, corn, wheat, rice, or barley
- Starchy roots such as cassavas, yams; plantains; bananas; coconuts; peanuts; fresh fruits; hot peppers; tomatoes; onions, okra
- Palm oil; fruit wine; tea; coffee; honey; molasses

Exclude:

- Milk and milk products (meat and fish limited use)

SOUTHERN BLACK AMERICANS FROM WEST AFRICA
 (Many generations in United States)

Include:

- Rice; hominy grits; biscuits; cornmeal and cornbread
- Legumes; potatoes; onions, tomatoes; hot peppers; green leafy vegetables; okra; sweet potatoes; squashes; corn; cabbage; melons; peaches
- Smoked pork; meats and poultry; fish; thick stews
- Pecans; butter, shortening, and lard; sugar; bread puddings, pies, and sweets

Exclude:

- Milk and milk products
- Yeast breads

CHINESE AMERICANS FROM CHINA
 (Diets sometimes vary with region.)

Include:

- Rice and rice gruel; wheat noodles; soy bean noodles
- Corn; cabbage-like vegetables; squashes; cucumbers; eggplant; leafy vegetables; various shoots (bamboo, mung, and soy); sweet potatoes; radishes; onions; peas and pods; mushrooms; roots; local vegetables; pickled vegetables; sea vegetables; plums; peaches; tangerines; kumquats; citrus fruits; litchis; longans; mangoes; papayas; pomegranates

Figure 9**CHARACTERISTICS OF SELECTED ETHNIC DIETS**

- Soybean products (tofu and soy milk); meat; fish with bones; poultry; seafood
- Soup or tea as beverage; soy sauce; sugar

Exclude:

- Milk and most milk products

JAPANESE AMERICANS FROM JAPAN**Include:**

- Rice
- Vegetables (including pickled and sea); fruits; salads
- Soy (miso, tofu, bean paste); fish with bones; seafood
- Sugars as seasoning; ginseng; soy sauce

Exclude:

- Milk and milk products

KOREAN AMERICANS FROM SOUTH KOREA**Include:**

- Rice; noodles
- Leafy vegetables; kimchi (hot pickled cabbage); sea vegetables; hot peppers; seasonal fruits; mushrooms
- Small fish with bones; grilled beef; chicken; squid; octopus; lobster; mussels; eggs
- Lard and vegetable fat for frying; sesame oil; nuts and seeds; ginger; sugar as seasoning

Exclude:

- Milk and milk products

VIETNAMESE AMERICANS FROM VIETNAM**Include:**

- Rice; rice noodles; french bread and croissants
- Hot peppers; curries of asparagus and potatoes; salads; tropical fruits and vegetables; lemons and limes
- Small portions of poultry; eggs; fish pates; nuoc nam (a strong, fermented fish sauce)
- Sweets, candies; sweetened drinks; coffee; tea; butter

Exclude:

- Milk and milk products

NATIVE AMERICANS**Include:**

- Southeast: corn; cornmeal; coontie (palmlike plant flour); fried breads; pumpkins; squashes; papayas; alligator, snake, wild hog, duck, fish, and shellfish
- Northeast: blueberries; cranberries; beans; corn; pumpkins; fish; lobster; wild game; maple syrup
- Midwest: bison; beans; corn; melons; squashes; tomatoes
- Southwest: corn (many varieties); beans; squash; pumpkins; chili peppers; melons; pinenuts; cactus
- Northwest: salmon; caviar; fish; otter; seal; elk; whale; bear; other game; wild fruits, nuts, and greens

Exclude:

- Milk and milk products

ITALIAN AMERICANS FROM ITALY**Include:**

- Northern Italy: egg-based, ribbon-shaped pastas; cheese; cream; butter; meat; eggs
- Southern Italy: wheat pastas; artichokes, eggplants, peppers, and tomatoes; beans; olive oil

BOX 1: Risk Factors for Malnutrition

- Pressure ulcers or altered skin integrity
- Excessive activity level
- Immobility; that is, dependency, disability, or impairment in ADL
- Cancer and its treatments
- AIDS or HIV
- GI complications (eg, malabsorption, diarrhea, digestion, bowel changes)
- Catabolic or hypermetabolic conditions (eg, burns, stress, trauma, sepsis)
- Physical signs (eg, alopecia)
- Food allergies
- Alterations in anthropometric measures, weight or body mass index, marked overweight or underweight for height and age, midarm muscle circumference/triceps skinfold as appropriate, amputation, limb length, height, and head circumference
- Declining sensory function (ie, loss of smell, taste, vision)
- Fat or muscle wasting (including cachexia)
- Obesity/overweight
- Chronic renal or cardiac problems, diabetes and related complications, hypertension
- Osteoporosis or osteomalacia
- Fluid and/or electrolyte imbalance
- Neurologic impairment
- Visual impairment
- Other acute and chronic disorders
- Extremes in age (eg, over 80 years old, very young, premature infant)
- Adolescent pregnancy, closely spaced pregnancies, or three or more pregnancies

Physical Conditions and Diseases/Disorders

This potential risk category, physical conditions and diseases/disorders, includes history or evidence of the risk factors listed in *Box 1*.

Observe the client's skin condition including signs of dehydration, edema, and/or ascites. These signs may be indicative of protein deficiency, renal disease, or hepatic disease. All have potential nutritional significance. Loose skin may be evidence of weight loss, and the interviewer should question the client about his or her usual weight. Make a visual scan for dry, flaky skin, skin that tents (which can relate to dehydration), or for nonhealing wounds, purpurae, or bruises.

As a person ages dramatic changes in the skin occur. Sweat glands diminish in number. The epithelial and fatty layers of tissue atrophy and thin. Both collagen and elastic components of the dermis undergo degenerative changes. The collagen content of the skin decreases about 1% per year throughout adult life. The result is

a thin, dry, and inelastic skin.¹³ The loss of subcutaneous fat in the older client results in frequent complaints of being cold. See *Table 1*, Physical Signs of Malnutrition, to help identify additional problems. See Special Consideration — Skin Conditions in Chapter 13.

Anthropometry

Anthropometry is the measurement of body size, weight, and proportions and is used to evaluate clients' nutritional status. Low body weight, when associated with illness or injury, increases the risk of morbidity. Obesity is common among nonambulatory clients whose caloric expenditure is low. The RD/DTR should ensure that the methods used to weigh and measure clients are reliable, since accurate height and weight data are imperative. Loss of height, for example, is an early indicator of osteoporosis.¹⁴ Measure and record height annually.

TABLE 1: PHYSICAL SIGNS OF MALNUTRITION

Signs	Possible Causes
Hair	
Dull, dry; lack of natural shine	Protein-energy deficiency
Thin, sparse, loss of curl	Zinc deficiency
Color changes; depigmentation; easily plucked	Other nutrient deficiencies: manganese, copper
Eyes	
Small, yellowish lumps around eyes	Hyperlipidemia
White rings around both eyes	
Pale eye membranes	Vitamin B ₁₂ , folacin, and/or iron deficiencies
Night blindness, dry membranes, dull or soft cornea	Vitamin A, zinc deficiencies
Redness and fissures of eyelid corners	Niacin deficiency
Angular inflammation of eyelids	Riboflavin deficiency
Ring of fine blood vessels around cornea	Generally poor nutrition
Lips	
Redness and swelling of mouth	Niacin, riboflavin, iron, and/or pyridoxine deficiencies
Angular fissures, scars at corner of mouth	
Gums	
Spongy; swollen; bleed easily; redness	Vitamin C deficiency
Gingivitis	Vitamin A, niacin, riboflavin deficiencies
Mouth	
Cheilosis, angular scars	Riboflavin, folic acid deficiencies
Tongue	
Sores, swollen, scarlet, and raw	Folacin, niacin deficiencies
Smooth with papillae (small projections)	Riboflavin, vitamin B ₁₂ , pyridoxine deficiencies
Glossitis	Iron, zinc deficiencies
Purplish color	Riboflavin deficiency
Taste	
Sense of taste diminished	Zinc deficiency
Teeth	
Gray-brown spots	Increased fluoride intake
Missing or erupting abnormally	Generally poor nutrition
Face	
Skin color loss, dark cheeks and eyes; enlarged parotid glands, scaling of skin around nostrils	Protein-energy deficiency; specifically niacin, riboflavin, and pyridoxine deficiencies
Pallor	Iron, folacin, vitamin B ₁₂ , and vitamin C deficiencies
Hyperpigmentation	Niacin deficiency
Neck	
Thyroid enlargement	Iodine deficiency
Symptoms of hypothyroidism	

continued

TABLE 1: PHYSICAL SIGNS OF MALNUTRITION

Nails	
Fragility, banding	Protein deficiency
Spoon-shaped	Iron deficiency
Skin	
Slow wound healing	Zinc deficiency
Psoriasis	Biotin deficiency
Scaliness	Biotin deficiency
Black and blue marks due to skin bleeding	Vitamin C and/or K deficiency
Dryness, mosaic, sandpaper feel, flakiness	Increased or decreased vitamin A
Swollen and dark	Niacin deficiency
Lack of fat under skin or bilateral edema	Protein-energy deficiency
Yellow colored	Carotene deficiency or excess
Cutaneous flushing	Niacin
Pallor	Iron, folic acid deficiencies
Gastrointestinal	
Anorexia, flatulence, diarrhea	Vitamin B ₁₂ deficiencies
Muscular System	
Weakness	Phosphorus or potassium deficiency
Wasted appearance	Protein-energy deficiency
Calf tenderness; absent knee jerks	Thiamin deficiency
Peripheral neuropathy	Folacin, pyridoxine, pantothenic acid, phosphate, thiamin deficiencies
Muscle twitching	Magnesium or pyridoxine excess or deficiency
Muscle cramps	Chloride decreased, sodium deficiency
Muscle pain	Biotin deficiency
Skeletal System	
Demineralization of bone	Calcium, phosphorus, vitamin D deficiencies
Epiphyseal enlargement of leg and knee	Vitamin D deficiency
Bowed legs	Vitamin D deficiency
Nervous System	
Listlessness	Protein-energy deficiency
Loss of position and vibratory sense; decrease and loss of ankle and knee reflexes	Thiamin, vitamin B ₁₂ deficiencies
Seizures, memory impairment, and behavioral disturbances	Magnesium, zinc deficiencies
Peripheral neuropathy, dementia	Pyridoxine deficiency

STANDARD MEASURES

Stature

To obtain height on an ambulatory client:

- Have the person being measured wear minimum clothing so that posture can be clearly seen.
- Instruct person to stand tall, with bare heels as close together as possible, legs straight, arms at sides, shoulders relaxed, head erect, and eyes looking straight ahead.
- Have person take deep breath.
- Take measurement at point of person's maximum inspiration with your eyes at headboard level to avoid errors due to parallax.
- Record measurement to nearest 0.1 cm or 0.125 in; repeated measurements should agree within 1 cm or 0.5 in.
- Compare present measurement with previous stature measurement(s) and with reference tables or graphs to determine change and to aid with interpretation of measurements.

Height

To estimate the height of nonambulatory persons use the following method which must be documented as an estimate^{15,16}:

- The arm span measurement is roughly equal to the height of both men and women at maturity (within approximately 10%). Span measurement is calculated as follows: with the upper extremities including the hands fully extended and parallel to the ground at 90° angle to torso, measure the distance between the tip of one middle finger to the tip of the other middle finger. The span measurement remains constant in spite of decreasing height and is an acceptable alternate method of establishing the height.
- For those clients who cannot hold arms out straight, measure from mid-sternum to the tip of the middle finger. Double this number. Document as estimated height.

Weight

Ambulatory clients should be weighed on the same scale each time. If the nonambulatory client can sit, a movable wheelchair balance or a wheel scale is used. The total weight minus the weight of the wheelchair equals the weight of the client. Bed scales should be used for weighing bedfast clients.

Standing measurement

To obtain an accurate standing weight:

- Be familiar with the use of the instrument.
- Calibrate scale to zero.
- Weigh client at same time of day and, if possible, have same caregiver weigh client.
- Weigh client nude or in light underclothing, without shoes.
- Position client's feet over center of platform.
- Adjust weights on balance beam, then read and accurately record measurement to nearest 0.25 lb; on a digital scale the reading should be to the nearest 0.1 kg/lb.
- Compare present measurement with previous weight measurement(s) and with reference tables or graphs to determine change and to aid with interpretation of measurements.

Seated or prone measurement

Suggestions for an accurate seated or prone measurement include the following:

- For a chair scale, position the subject upright in the center of the chair, leaning on backrest.
- Weigh the client and the wheelchair, then weigh the wheelchair alone and subtract that weight.
- For a bed scale, position the subject comfortably in the center of the sling.

A second measurement for either method must be taken to verify accuracy of weight.

Frequent checking and adjustment of the zero weight on the horizontal beam of the scale are necessary to ensure accuracy. The main and fractional sliding weights should be placed at their respective zero positions, and the zeroing weight should then be checked with a set of standard weights or by a dealer of weights and measures at least two or three times a year. Accurate weights are critical for the RD when evaluating the nutritional status of a client.

Body Frame Size

Following are two methods to estimate body frame size:

1. **Wrist circumference** size is determined by measuring the smallest part of the wrist distal to the styloid process of the ulna and radius. Values are affected by variability of the soft tissue. The *r* value¹⁷ is then determined by the following ratio and compared with the ranges in *Table 2*.

$$\frac{\text{Height in centimeters}}{\text{Wrist circumference in centimeters}}$$

TABLE 2: r VALUES FOR FRAME SIZE

Men r Value	Frame Size	Women r Value
≥ 10.4	Small	≥ 11.0
9.6 - 10.4	Medium	10.1 - 11.01
≤ 9.6	Large	≤ 10.1

Source: Grant J. *Handbook of Total Parenteral Nutrition*. Philadelphia, Penn: W B Saunders Co; 1980.

TABLE 3: ELBOW BREADTH MEASURES FOR MEDIUM-SIZE FRAME

Women	
Height in 1-in heels	Elbow breadth
4'10" - 4'11"	2 1/4" - 2 1/2"
5'0" - 5'3"	2 1/4" - 2 1/2"
5'4" - 5'7"	2 3/8" - 2 5/8"
5'8" - 5'11"	2 3/8" - 2 5/8"
6'0"	2 1/2" - 2 3/4"
Men	
Height in 1-in heels	Elbow breadth
5'2" - 5'3"	2 1/2" - 3 7/8"
5'4" - 5'7"	2 5/8" - 2 7/8"
5'8" - 5'11"	2 3/4" - 3"
6'0" - 6'3"	2 3/4" - 3 1/8"
6'4"	2 7/8" - 3 1/4"

Adapted with permission from Frisancho AR. Elbow breadth as a measure of frame size for US males and females. *Am J Clin Nutr*. 1983;37:311-314. ©American Society for Clinical Nutrition.

2. **Elbow breadth** is measured with the forearm upward at a 90° angle. The distance between the outer aspects of the two prominent bones on either side of the elbow is considered to be the elbow breadth. An elbow breadth less than the medium-frame values listed in *Table 3* indicates a small frame. An elbow breadth greater than those listed in *Table 3* indicates a large frame.

Body Mass Index

Body mass index (BMI) is used as an indicator of body fatness and/or ideal body weight. The BMI is a weight to height ratio composed of body weight (in kilograms) divided by the square of the height in meters, or weight/height. Minimum survivable weight for humans is probably 50% to 55% of desirable body weight. The Committee on Diet and Health, 1989, states that a BMI of less than 24 is significant for people older than 65

years.¹⁸ The BMI is highly correlated with body fat, but increased lean body mass or a large body frame can also increase the BMI. It is generally agreed that a normally hydrated person with a BMI of 30 would be obese, and that a person with a BMI of more than 27 would be at major risk for obesity.

The Longitudinal Study of Aging (LSOA) is a longitudinal survey conducted by the National Center for Health Statistics (NCHS) from 1984 through 1990 of over 7,000 older adults (ages 70+) throughout the United States. Vector Research, Inc., examined the relationship between BMI and health care utilization in 1984 and 1986.¹⁹ Its preliminary analysis of the LSOA evaluated the relationship between BMI and health care utilization with and without the presence of chronic disease and disability. Health care utilization was statistically higher among those with the lowest BMIs (< 18) compared to those with an average BMI (24 to 26) in this study. Regardless of the presence or absence of a chronic condition, those with lower BMIs (< 24) had greater health care utilization than those with moderate (24 to 26) or even higher BMIs (> 27).

A healthy BMI for older adults does not "fit" into the established guidelines for younger adults. In these studies, there were greater health care utilization, functional decline, and higher rates of mortality in those older adults who had lower BMI. The analysis suggests that these individuals also have greater risks than those with higher BMI. Critics have suggested that those with low BMIs have greater health care utilization than those with an average or higher BMI due to underlying critical conditions. Therefore, analysis of the LSOA controlled for critical conditions suggests that with and without the presence of critical conditions, older adults with low BMI have greater health care utilization and a higher risk for mortality. It appears that the healthiest BMI is actually around 24 for older adults greater than 70 years of age, since these BMIs were associated with the least health care utilization and risk for mortality.

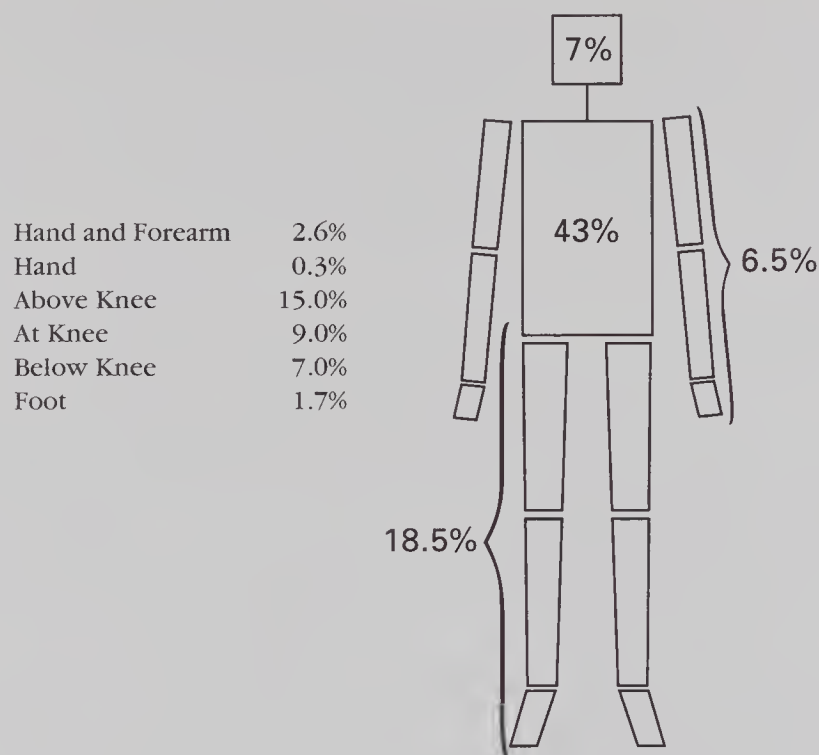
The BMI table (*Table 4*) is not age-related because it does not consider the variable height loss with age. Thus, if your height decreases while your weight

TABLE 4: BODY MASS INDEX

Height Inches Meters	Weight kg (lb)																			
	45.3	49.90	54.43	58.97	63.50	68.04	72.57	77.11	81.65	86.18	90.72	95.25	99.79	104.33	108.86	113.40	117.93	122.47	127.01	131.54
	(100)	(110)	(120)	(130)	(140)	(150)	(160)	(170)	(180)	(190)	(200)	(210)	(220)	(230)	(240)	(250)	(260)	(270)	(280)	(300)
55	1.397	23.24	25.56	27.89	30.21	32.54	34.86	37.19	39.51	41.84										
56	1.422	22.43	24.67	26.92	29.16	31.40	33.65	35.89	38.13	40.37	42.62									
57	1.448	21.64	23.80	25.96	28.13	30.29	32.46	34.62	36.79	38.95	41.12	43.28								
58	1.473	20.90	22.99	25.08	27.17	29.26	31.35	33.44	35.53	37.62	39.71	41.80	43.89							
59	1.498	20.20	22.22	24.24	26.26	28.28	30.29	32.32	34.33	36.35	38.37	40.39	42.41	44.43						
60	1.524	19.53	21.48	23.43	25.39	27.34	29.29	31.25	33.20	35.15	37.11	39.06	41.01	42.96	44.92	46.87	48.82	50.78	52.73	54.68
61	1.549	18.89	20.78	22.67	24.56	26.45	28.34	30.23	32.12	34.01	35.90	37.79	39.68	41.57	43.46	45.35	47.24	49.13	51.02	52.90
62	1.575	18.29	20.12	21.95	23.78	25.61	27.44	29.26	31.09	32.92	34.75	36.58	38.41	40.24	42.07	43.90	45.72	47.55	49.38	51.21
63	1.600	17.71	19.48	21.26	23.03	24.80	26.57	28.34	30.11	31.88	33.66	35.43	37.20	38.97	40.74	42.51	44.28	46.06	47.83	49.60
64	1.626	17.16	18.88	20.60	22.31	24.03	25.75	27.46	29.18	30.90	32.61	34.33	36.05	37.76	39.48	41.20	42.91	44.63	46.34	48.06
65	1.651	16.64	18.30	19.97	21.63	23.30	24.96	26.62	28.29	29.95	31.62	33.28	34.94	36.61	38.27	39.94	41.60	43.26	44.93	46.59
66	1.676	16.14	17.75	19.37	20.98	22.60	24.21	25.82	27.44	29.05	30.67	32.28	33.89	35.51	37.12	38.74	40.35	41.96	43.58	45.19
67	1.702	15.66	17.23	18.79	20.36	21.93	23.49	25.06	26.62	28.19	29.76	31.32	32.89	34.46	36.02	37.59	39.15	40.72	42.29	43.85
68	1.727	15.20	16.72	18.24	19.77	21.29	22.81	24.33	25.85	27.37	28.89	30.41	31.93	33.45	34.97	36.49	38.01	39.53	41.05	42.57
69	1.753	14.77	16.24	17.72	19.20	20.67	22.15	23.63	25.10	26.58	28.06	29.53	31.01	32.49	33.96	35.44	36.92	38.39	39.87	41.35
70	1.778	14.35	15.78	17.22	18.65	20.09	21.52	22.96	24.39	25.83	27.26	28.70	30.13	31.57	33.00	34.44	35.87	37.30	38.74	40.17
71	1.803		15.34	16.74	18.13	19.52	20.92	22.32	23.71	25.10	26.50	27.89	29.29	30.68	32.08	33.47	34.87	36.26	37.66	39.05
72	1.829		14.92	16.27	17.63	18.99	20.34	21.70	23.05	24.41	25.77	27.12	28.48	29.84	31.19	32.55	33.90	35.26	36.62	37.97
73	1.854		14.51	15.83	17.15	18.47	19.79	21.11	22.43	23.75	25.07	26.39	27.71	29.02	30.34	31.66	32.98	34.30	35.62	36.94
74	1.879		14.12	15.41	16.69	17.97	19.26	20.54	21.83	23.11	24.39	25.68	26.96	28.25	29.53	30.81	32.10	33.38	34.66	35.95
75	1.905			14.99	16.25	17.50	18.75	20.00	21.25	22.50	23.75	25.00	26.25	27.49	28.75	30.00	31.25	32.50	33.75	35.00
76	1.930				14.61	15.82	17.04	18.26	19.47	20.69	21.91	23.13	24.34	25.56	26.78	27.99	29.21	30.43	31.65	32.86

* From Bray GA, et al. Evaluation of the obese patient. I. An algorithm. *JAMA*. 1976;235:1487-1491. Copyright 1976, American Medical Association. Used by permission.

† Expressed as weight (kg)/height (meters)².

Figure 10**Percentage of Total Body Weight Contributed by Individual Body Parts**

Adapted with permission from R & C Matson, Comp-Cal Pro Edition, 4th Printing, 10/93.

remains stable, your BMI increases, which may not be a true indication of nutritional status. It is recommended the midarm circumference be measured. This measure that is highly correlated with the BMI (the Spearman rank correlation coefficient of midarm circumferences with BMI for the institutionalized older adult is 0.69 for men and 0.89 for women). Low weight for height calculated as BMI may indicate poor nutritional status.¹⁸⁻²¹

Amputation

The percentages shown in *Figure 10* can be used as a guide when calculating an adjusted weight for an amputation.

Example:

Previous target weight range: 131 lb - 161 lb
 Adjusted weight range with above-the-knee amputation (AKA)
 $131 \times .07 (7\%) = 9.17$ lb
 $161 \times .07 = 11.27$ lb
 Adjusted body weight: 122 lb - 150 lb

Paraplegics and Quadriplegics

To calculate the ideal body weight (IBW) for clients who are paralyzed, first determine the ideal body

weight and subtract the following values from the original weight. The values depend on the degree of paralysis. See *Figure 10*.

- For paraplegics: 5% to 10%
- For quadriplegics: 10% to 15%^{22,23}

Example:

IBW: 145 lb
 Some quadriplegics 15%
 $145 \times .15 (15\%) = 21.75$
 $145 - 21.75 = 123.25$ lb
 Adjusted body weight: 123.25 lb

Height and Weight

Weight and body composition change with age. Weight tends to peak in the sixth decade, with a gradual decrease beyond the seventh decade. Shifts in body composition are noted and the proportion of body weight that is fat increases, averaging 30% of the total body weight in the older adult, as compared to 20% of the total body weight in younger people. The Hamwi Formula²⁴ (*Box 2*) is frequently used to calculate desirable body weight, or IBW, for the older adult. *Table 5* illustrates the use of the Hamwi Formula and frame size.

BOX 2: Ideal Body Weight–Hamwi Formula

Women: 100 lb + 5 lb for each inch of height above 5 ft

Example: height 5'6"

$$100 + (6 \times 5)$$

$$100 + 30 = 130$$

$$\text{IBW} = 130$$

Men: 106 lb + 6 lb for each inch height above 5 ft

Example: 5'10"

$$106 + (10 \times 6)$$

$$106 + 60 = 166$$

$$\text{IBW} = 166$$

10% is added for a large frame and 10% deducted for a small frame.

Table 6 represents the Metropolitan Life Insurance Company's height-weight tables, and Table 7 represents average weights and heights of white Americans ages 65 to 94. However, some older adult clients may have a target or usual weight that does not correlate with any table. An 85-year-old woman may never reach a weight of 100 pounds, and an obese client may never achieve an "ideal" weight. The important issue is achieving a stable weight over a period of 6 months or more.

Usual body weight (UBW) is the preferred standard for older adults.

Weight Variances

Variances in weight have significant impact on nutritional health, and degree of weight change has positive correlations with impact on health status. When evaluating weight variances, it is important to determine possible causes such as recent surgery or the treatment initiated

Severity of Weight Loss²⁵

Significant weight loss:

- 10% in 6 months
- 7.5% in 3 months
- 5% in 1 month
- 2% in 1 week

Severe weight loss:

- > 10% in 6 months
- > 7.5% in 3 months
- > 5% in 1 month
- > 2% in 1 week

(eg, radiation or diuretic therapy) which can affect weight status. Weight variances can also occur when caregivers fail to use correct procedures to weigh a client or weigh at different times of the day. Procedures and protocols for addressing weight change need to be in place to ensure accurate weights. Significant weight loss should be reported to both the physician and the RD to ensure proper intervention.

Evaluating the Significance of Weight Loss

The formula to determine weight change is:

$$\text{Weight loss \%} = \frac{\text{UBW} - \text{CBW}}{\text{UBW}} \times 100$$

UBW = Usual Body Weight

CBW = Current Body Weight

Example:

$$\frac{115 - 105}{115} = 8.7\% \text{ loss}$$

Evaluating Obesity

An adjusted IBW is often used to calculate calories and protein for the obese client.

Adjusted Body Weight =

$$\text{Current Weight} - \text{IBW} \times .25 + \text{IBW}$$

Example:

$$145 \text{ lb} = 220 \text{ lb} - 120 \text{ lb} \times .25 + 120$$

TABLE 5: IDEAL BODY WEIGHT (WOMEN AND MEN)

Women				
	Weight Based on Frame Size & Height			Weight Based on Height
	Small	Medium	Large	General Range
4'5"				77-105
4'6"				79-107
4'7"				83-101
4'8"				85-103
4'9"				85-103
4'10"				86-106
4'11"				88-108
5'0"	85-95	96-105	106-115	90-110
5'1"	90-100	101-110	111-121	95-116
5'2"	94-104	105-115	116-126	99-121
5'3"	99-109	110-120	121-132	104-127
5'4"	103-113	114-125	126-137	108-132
5'5"	108-118	119-130	131-141	113-136
5'6"	112-122	123-135	136-148	117-143
5'7"	117-127	128-140	141-154	122-149
5'8"	121-131	132-145	146-159	126-154
5'9"	126-136	137-150	151-165	131-160
5'10"	130-140	141-155	156-170	135-165
5'11"	135-145	146-160	161-176	140-171
6'0"	139-149	150-165	166-181	144-176

Men				
	Weight Based on Frame Size & Height			Weight Based on Height
	Small	Medium	Large	General Range
4'10"	78-88	89-99	100-110	80-97
4'11"	84-94	95-105	106-116	85-104
5'0"	90-100	101-111	112-122	95-117
5'1"	96-106	107-117	118-128	101-123
5'2"	100-111	112-123	124-135	106-130
5'3"	107-117	118-129	130-141	112-136
5'4"	110-122	123-135	136-148	117-143
5'5"	117-127	128-141	142-155	122-150
5'6"	121-133	134-147	148-161	128-156
5'7"	128-138	139-153	154-168	133-163
5'8"	134-144	145-159	160-174	139-169
5'9"	139-149	150-165	166-181	144-176
5'10"	144-154	155-171	172-188	149-183
5'11"	150-160	161-177	178-194	155-189
6'0"	155-165	166-183	184-201	160-196
6'1"	161-171	172-189	190-207	166-202
6'2"	166-176	177-195	196-214	171-209
6'3"	171-181	182-201	202-221	176-216
6'4"	177-187	188-207	208-227	182-222

TABLE 6: 1983 METROPOLITAN HEIGHT-WEIGHT TABLES
1983 METROPOLITAN HEIGHT-WEIGHT TABLES
DESIRABLE WEIGHTS FOR MEN*†

Height	Small Frame	Medium Frame lb	Large Frame
5'2"	128-134	131-141	138-150
5'3"	130-136	133-143	140-153
5'4"	132-138	135-145	142-156
5'5"	134-140	137-148	144-160
5'6"	136-142	139-151	146-164
5'7"	138-145	142-154	149-168
5'8"	140-148	145-157	152-172
5'9"	142-151	148-160	155-176
5'10"	144-154	151-163	158-180
5'11"	146-157	154-166	161-184
6'0"	149-160	157-170	164-188
6'1"	152-164	160-174	168-192
6'2"	155-168	164-178	172-197
6'3"	158-172	167-182	176-202
6'4"	162-176	171-187	181-207

* Courtesy of Metropolitan Life Insurance Company. Reprinted with permission.

† Weights at ages 25 to 59 based on lowest mortality. Weight in pounds according to frame (in indoor clothing weighing 5 lb, shoes with 1" heels).

1983 METROPOLITAN HEIGHT-WEIGHT TABLES
DESIRABLE WEIGHTS FOR WOMEN*†

Height	Small Frame	Medium Frame lb	Large Frame
4'10"	102-111	109-121	118-131
4'11"	103-113	111-123	120-134
5'0"	104-115	113-126	122-137
5'1"	106-118	115-129	125-140
5'2"	108-121	118-132	128-143
5'3"	111-124	121-135	131-147
5'4"	114-127	124-138	134-151
5'5"	117-130	127-141	137-155
5'6"	120-133	130-144	140-159
5'7"	123-136	133-147	143-163
5'8"	126-139	136-150	146-167
5'9"	129-142	139-153	149-170
5'10"	132-145	142-156	152-173
5'11"	135-148	145-159	155-176
6'0"	138-151	148-162	158-179

* Courtesy of Metropolitan Life Insurance Company. Reprinted with permission.

† Weights at 25 to 59 based on lowest mortality. Weight in pounds according to frame (in indoor clothing weighing 3 lb, shoes with 1" heels).

TABLE 7: AVERAGE HEIGHTS AND WEIGHTS OF AMERICANS 65-94

	Height (in)	Ages 65-69	Ages 70-74	Ages 75-79	Ages 80-84	Ages 85-89	Ages 90-94
Men							
	61	128-156	125-153	123-151			
	62	130-158	127-155	125-153	122-148		
	63	131-161	129-157	127-155	122-150	120-146	
	64	134-164	131-161	129-157	124-152	122-148	
	65	136-166	134-164	130-160	127-155	125-153	117-143
	66	139-169	137-167	133-163	130-158	128-156	120-146
	67	140-172	140-170	136-166	132-162	130-160	122-150
	68	143-175	142-174	139-169	135-165	133-163	126-154
	69	147-179	146-178	142-174	139-169	137-167	130-158
	70	150-184	148-182	146-178	143-175	140-172	134-164
	71	155-189	152-186	149-183	148-180	144-176	139-169
	72	159-195	156-190	154-188	153-187	148-182	
	73	164-200	160-196	158-192			
Women							
	58	120-146	112-138	111-135			
	59	121-147	114-140	112-136	100-122	99-121	
	60	122-148	116-142	113-139	106-130	102-124	
	61	123-151	118-144	115-141	109-133	104-128	
	62	125-153	121-147	118-144	112-136	108-132	107-131
	63	127-155	123-151	121-146	115-141	112-136	107-131
	64	130-158	126-154	123-151	119-145	115-141	108-132
	65	132-162	130-158	126-154	122-150	120-146	112-136
	66	136-166	132-162	128-157	126-154	124-152	116-142
	67	140-170	136-166	131-161	130-158	128-156	
	68	143-175	140-170				
	69	148-180	144-176				

Source: Adapted from Master AM, Laser RP, Beckman G. Tables of average weight and height of Americans aged 65 to 94 years. *JAMA*. 1960;172:658. ©1960, American Medical Association. Reprinted with permission.

TABLE 8: BASAL ENERGY EXPENDITURE (BEE)*: MALES

Weight						Height					Age					
lb	kg	kcal	lb	kg	kcal	ft	in	in	cm	kcal	yr	kcal	yr	kcal	yr	kcal
88.0	40	616	187.0	85	1235	4'	7"	55	139.7	699	18	122	48	324	78	527
90.2	41	630	189.2	86	1249		8	56	142.2	711	19	128	49	331	79	534
92.4	42	644	191.4	87	1263		9	57	144.8	724	20	135	50	331	80	541
94.6	43	658	193.6	88	1276		10	58	147.3	737	21	142	51	345	81	648
96.8	44	671	195.8	89	1290		11	59	149.9	749	22	149	52	352	82	554
99.0	45	685	198.0	90	1304	5'	0"	60	152.4	762	23	155	53	358	83	561
101.2	46	699	200.2	91	1318		1	61	154.9	776	24	162	54	365	84	568
103.4	47	713	202.4	92	1331		2	62	157.5	787	25	169	55	379	85	575
105.6	48	726	204.6	93	1345		3	63	160.0	800	26	176	56	379	86	581
107.8	49	740	206.8	94	1359		4	64	162.6	813	27	183	57	385	87	588
110.0	50	754	209.0	95	1373	5'	5"	65	165.1	825	28	189	58	392	88	595
112.2	51	768	211.2	96	1386		6	66	167.6	838	29	196	59	399	89	602
114.4	52	781	213.4	97	1400		7	67	170.2	851	30	203	60	406	90	608
116.6	53	795	215.6	98	1414		8	68	172.7	864	31	210	61	412	91	615
118.8	54	809	217.8	99	1428		9	69	175.3	876	32	216	62	419	92	622
121.0	55	823	220.0	100	1441	5'	10"	70	177.8	889	33	223	63	426	93	629
123.2	56	836	222.2	101	1455		11	71	180.3	902	34	230	64	433	94	635
125.4	57	850	224.4	102	1469	6'	0"	72	182.9	914	35	237	65	439	95	642
127.6	58	864	226.6	103	1483		1	73	185.4	927	36	243	66	446	96	649
129.8	59	878	228.8	104	1496		2	74	188.0	940	37	250	67	453	97	656
132.0	60	891	231.0	105	1510	6'	3"	75	190.5	953	38	257	68	460		
134.2	61	905	233.2	106	1524		4	76	193.0	965	39	264	69	466		
136.4	62	919	235.4	107	1538		5	77	195.6	978	40	270	70	473		
138.6	63	933	237.6	108	1551		6	78	198.1	991	41	277	71	480		
140.8	64	946	239.8	109	1565		7	79	200.7	1003	42	284	72	487		
143.0	65	960	242.0	110	1579	6'	8"	80	203.2	1016	43	291	73	493		
145.2	66	974	244.2	111	1593		9	81	205.7	1029	44	297	74	500		
147.4	67	988	246.4	112	1606		10	82	208.3	1041	45	304	75	507		
149.6	68	1001	248.6	113	1620		11	83	210.8	1054	46	311	76	514		
151.8	69	1015	250.8	114	1634	7'	0	84	213.4	1067	47	318	77	521		
154.0	70	1029	253.0	115	1648											
156.2	71	1043	255.2	116	1661											
158.4	72	1066	257.4	117	1675											
160.6	73	1070	259.6	118	1689											
162.8	74	1084	261.8	119	1703											
165.0	75	1098	264.0	120	1716											
167.2	76	1111	266.2	121	1730											
169.4	77	1125	268.4	122	1744											
171.6	78	1139	270.6	123	1758											
173.8	79	1153	272.8	124	1771											
176.0	80	1166														
178.2	81	1180														
180.4	82	1194														
182.6	83	1208														
184.8	84	1221														

How to use this table:**Step 1:** Obtain weight, height, and age of male subject.**Step 2:** BEE = weight kcal + height kcal - age kcal**Example:** 70-kg, 178-cm, 45-year-old male

$$\text{BEE} = 1029 + 889 - 304$$

$$\text{BEE} = 1614$$

* Based on the Harris-Benedict equation: $\text{BEE} = 66.47 + (13.75 \times \text{weight in kg}) + (5.0 \times \text{height in cm}) - (6.76 \times \text{age in years})$.

Source: Harris J, Benedict F. A Biometric Study of Basal Metabolism in Man. Washington, DC: Carnegie Institution. 1919:40-44. Publication 279.

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TABLE 9: BASAL ENERGY EXPENDITURE (BEE)*: FEMALES

Weight						Height					Age					
lb	kg	kcal	lb	kg	kcal	ft	in	in	cm	kcal	yr	kcal	yr	kcal	yr	kcal
77.0	35	990	176.0	80	1420	4'	0"	48	121.9	226	18	84	48	225	78	365
79.2	36	999	178.2	81	1429		1	49	124.5	230	19	89	49	229	79	370
81.4	37	1009	180.4	82	1439		2	50	127.0	235	20	94	50	234	80	374
83.6	38	1018	182.6	83	1449		3	51	129.5	240	21	98	51	239	81	379
85.8	39	1028	184.8	84	1458		4	52	132.1	244	22	103	52	243	82	384
88.0	40	1038	187.0	85	1468	4'	5"	53	134.6	249	23	108	53	248	83	388
90.2	41	1047	189.2	86	1477		6	54	137.2	254	24	112	54	253	84	393
92.4	42	1057	191.4	87	1487						25	117	55	257	85	398
94.6	43	1066	193.6	88	1496	4'	7	55	139.7	258	26	122	56	262	86	402
96.8	44	1076	195.8	89	1506		8	56	142.2	263	27	126	57	267	87	407
99.0	45	1085	198.0	90	1516		9	57	144.8	268	28	131	58	271	88	412
101.2	46	1095	200.2	91	1526						29	136	59	276	89	417
103.4	47	1104	202.4	92	1535	4'	10"	58	147.3	273	30	140	60	281	90	421
105.6	48	1114	204.6	93	1544		11	59	149.9	277	31	145	61	285	91	426
107.8	49	1124	206.8	94	1554						32	150	62	290	92	431
110.0	50	1133	209.0	95	1563	5'	0"	60	152.4	282	33	154	63	295	93	435
112.2	51	1143	211.2	96	1573		1	61	154.9	287	34	159	64	300	94	440
114.4	52	1152	213.4	97	1582		2	62	157.5	291	35	164	65	304	95	445
116.6	53	1162	215.6	98	1592						36	168	66	309	96	449
118.8	54	1171	217.8	99	1602	5'	3"	63	160.0	296	37	173	67	314	97	454
121.0	55	1181	220.0	100	1611		4	64	162.6	301	38	178	68	318	98	459
123.2	56	1190	222.2	101	1621		5	65	165.1	305	39	183	69	323	99	463
125.4	57	1200	224.4	102	1630		6	66	167.6	310	40	187	70	328	100	468
127.6	58	1210	226.6	103	1640		7	67	170.2	315	41	192	71	332	101	473
129.8	59	1219	228.8	104	1649	5'	8"	68	172.7	320	42	197	72	337	102	477
132.0	60	1229	231.0	105	1659		9	69	175.3	324						
134.2	61	1238	233.2	106	1668		10	70	177.8	329	43	201	73	342		
136.4	62	1248	235.4	107	1678		11	71	180.3	334	44	206	74	346		
138.6	63	1257	237.6	108	1688						45	211	75	351		
140.8	64	1267	239.8	109	1697	6'	0"	72	182.9	338	46	215	76	356		
143.0	65	1277	242.0	110	1707						47	220	77	360		
145.2	66	1286	244.2	111	1716											
147.4	67	1296	246.4	112	1726											
149.6	68	1305	248.6	113	1735											
151.8	69	1315	250.8	114	1745											
154.0	70	1324	253.0	115	1755											
156.2	71	1334	255.2	116	1764											
158.4	72	1343	257.4	117	1774											
160.6	73	1353	259.6	118	1783											
162.8	74	1363	261.8	119	1793											
165.0	75	1372														
167.2	76	1382														
169.4	77	1391														
171.6	78	1401														
173.8	79	1410														

How to use this table:**Step 1:** Obtain weight, height, and age of female subject.**Step 2:** BEE = weight kcal + height kcal - age kcal**Example:** 55-kg, 163-cm, 45-year-old female

$$\text{BEE} = 1189 + 302 - 211$$

$$\text{BEE} = 1271$$

* Based on the Harris-Benedict equation: $\text{BEE} = 655.19 + (9.56 \times \text{weight in kg}) + (1.85 \times \text{height in cm}) - (4.68 \times \text{age in years})$.Source: Harris J, Benedict F. *A Biometric Study of Basal Metabolism in Man*. Washington, DC: Carnegie Institution. 1919:40-44. Publication 279.

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TABLE 10: ACTIVITY FACTORS

1.2	for clients confined to bed
1.3	for ambulatory clients
1.5 - 1.75	for most normally active persons
2.0	for extremely active persons

KILOCALORIE NEEDS

A kilocaloric estimate must be completed for each client. To estimate kilocalories, calculate the basal energy expenditure (BEE) as specified in *Tables 8* and *9* and multiply it by the activity factor and the injury factor. (See *Tables 10* and *11*.)

PROTEIN REQUIREMENTS

The protein content of the body changes with age as muscle diminishes and body fat increases. Muscle-protein turnover accounts for 30% of the turnover in young adults and only 20% of that in older adults. Serum albumin levels also decrease in older adults, even those who consume diets with adequate protein. It is recommended that 12% to 14% of the total calories consumed by an older adult be in the form of protein if calorie intakes are decreased. This may necessitate increased protein

TABLE 11: INJURY FACTORS

1.00 - 1.05	Postoperative (no complications)
1.05 - 1.25	Peritonitis
1.10 - 1.45	Cancer
1.15 - 1.30	Long bone fracture
1.20 - 1.60	Wound healing
1.25 - 1.50	Blunt trauma
1.30 - 1.55	Severe infection/multiple trauma
1.50 - 1.70	Multiple trauma with client on ventilator
1.60 - 1.70	Trauma with steroids
1.75 - 1.85	Sepsis

Burns (% total body surface)

1.00 - 1.50	0% - 20%
1.50 - 1.85	20% - 40%
1.85 - 2.05	40% - 100%

Reprinted from: Consultant Dietitians in Health Care Facilities, Practice Group of The American Dietetic Association. *Pocket Resource for Nutrition Assessment*. Consultant Dietitians in Health Care Facilities; 1997:30.

intake. UBW is used in calculating the dietary protein requirements for an underweight person. (See *Box 3*.)

BOX 3: Protein Needs for Adults²⁶

Condition	Albumin Level	Protein Requirement
Normal nutrition	3.5 g/dL	0.8 g/kg/day
Mild depletion	2.8 - 3.5 g/dL	1.0 - 1.2 g/kg/day
Moderate depletion	2.1 - 2.7 g/dL	1.2 - 1.5 g/kg/day
Severe depletion	2.1 g/dL	1.5 - 2.0 g/kg/day

COPD 100 g - 125 g protein/day total

Exceptions:**Renal failure**

Nondialyzed 0.5 - 0.6 g/kg/day

Hemo-dialyzed 1.0 - 1.2 g/kg/day

Peritoneal-dialyzed 1.2 - 1.5 g/kg/day

Hepatic failure 0.25 - 0.5 g/kg/day

Pulmonary compromised 1.2 - 1.9 g/kg/day (maintenance)

1.6 - 2.5 g/kg/day (repletion)

Another method to calculate protein needs is as a ratio of grams nitrogen to nonprotein calories (6.25 g protein - 1 g N).

Patient Conditions	Ratio of Nonprotein kcal: 1 g N
Adult medical	125 - 150 : 1
Minor catabolic	125 - 180 : 1
Severe catabolic	150 - 250 : 1
Hepatic or renal failure	250 - 400 : 1

BOX 4: Fluid Status

- Congestive heart failure/edema = 25 cc/kg of body weight
- Normal fluid status = 25 - 30 cc/kg of body weight
- 1 mL/kcal
- 100 mL/kg for first 10 kg body weight + 50 mL/kg for second 10 kg body weight + 15 mL/kg for remaining kg body weight

OR shortcut to this method:

$$(\text{Kg body weight} - 20) \times 15 + 1,500 \text{ mL}$$

Source: JC Chidester and AA Spangler, Fluid intake in the institutionalized elderly, *J Am Diet Assoc*, 1997;97:23-28.

FLUID REQUIREMENTS

Baseline fluid requirements are determined by various methods. In older adults the water content of the body decreases from 60% of total body weight to approximately 45%. Older adults also tend to have a decreased thirst sensation; even healthy adults have reduced thirst after extended water deprivation. Meeting fluid needs is critical.

Since dehydration is a concern, special consideration for fluid replacement should be given to clients with severe vomiting/diarrhea or elevated temperature. When calculating needs, select the method most appropriate for the client. (See Box 4.)

LABORATORY VALUES

Abnormal lab values should be specific to the age and gender of the client. In the spirit of cost-effectiveness, health care payers, including managed care organizations (MCOs) and Medicare, limit the type and number of laboratory tests. The RD should request only those tests essential and diagnostically related to assessing and determining intervention.⁵ Physical assessment along with anthropometric measurements and observation at meal time indicates those at risk for poor nutritional status. Lab values can then document actual malnutrition.

MEDICATIONS

Chronic use of medication, either self-administered or prescribed, has the potential to significantly impact nutritional status. Many people mix prescribed drugs with over-the-counter medication. The RD should review the medical record and interview the client to determine all of the medications and supplements being taken. Anorexia, nausea, altered bowel functions, taste alterations, and drug/nutrient interactions are just a few examples of potential side effects. Chapter 9 discusses drug-nutrient interaction in detail.

SUMMARY

The nutrition screening and assessment process forms the basis for a plan of care for the older adult. Often in the assisted living or home care environment, the screening process may be completed by a designated health care professional who then notifies the RD of high-risk clients. The assessment is a comprehensive process that includes physical examination, anthropometric measurement, and laboratory values. If the condition of the client declines, a reassessment may be required to achieve positive outcomes.

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15 CHAPTER

Rehabilitating the Eating-Disabled Client

“There is more to life than eating.”

Considering the enjoyment received from dining with family and friends, finding an activity as important to our well-being as this one is difficult. The many lifestyle changes that accompany a change in health status can erode the older adult's dining pleasure, including the ability to eat independently.

Biological changes such as impaired hearing, impaired vision, and decreased sensory perception also may interfere with consuming a well-balanced meal or participating in mealtime conversation. Chronic degenerative diseases often result in physical impairment. Physical changes may interfere with the ability to purchase food, prepare meals, open packages, or use eating utensils. Loss of independent functioning may contribute to an individual's need for assistance and has the potential to detract from the quality of life.

Maintaining health with good nutrition is one aspect of quality of life. Consuming a variety of foods in portion sizes recommended in the Food Guide Pyramid¹ is essential for good health. When physical or mental impairments interfere with preparing a well-balanced meal, congregate meals or commercially prepared home replacement meals can be used to prevent a decline in nutritional health. Programs such as home-delivered meals and meals-on-wheels are available in most communities. Frozen meals can be purchased from grocery stores or food distributors, including pureed and other textured meals. However, clients may have difficulty following therapeutic diets when they are dependent on commercially prepared meals. In many instances, providing nutritious meals and maintaining quality of life outweigh the importance of obtaining a therapeutically restricted diet.² (See Chapter 5 for more information on liberalized diets.)

QUALITY OF LIFE

Quality of life includes elements of the basic hierarchy of human needs — hunger, thirst, and pain. These are followed by safety needs including security and

stability. The basic needs must be met before people can concern themselves with higher-level needs such as affection, conformity, and identification or self-esteem. In extended care facilities, six components of quality of life have been identified for these clients:

1. Autonomy and choice
2. Safety and security
3. Client-caregiver communication
4. Food and environment
5. Companionship
6. Help and assistance³

Considering these components for all older clients seems appropriate.

Food and the atmosphere in which the food is served have an impact on quality of life.^{4,7} The dining atmosphere is one of the most crucial aspects of creating a pleasurable dining experience. A pleasant atmosphere consists of attractive physical surroundings and, more important, a climate of friendship and respect. Because of the social significance of mealtime, every effort should be made to make each meal a positive experience.

People enjoy eating with family and friends. The ability to choose dining companions as well as the food has a positive impact on one's quality of life. In extended care facilities, assisted living centers, adult day care centers, and congregate meal sites, seating arrangements should consider groupings that foster social interaction. Caregivers should encourage interaction among diners and also visit with clients during mealtimes. However, clients will benefit most from sharing mealtimes with others of their own choosing who also demonstrate a similar level of cognitive functioning. Placing confused, noisy, or behaviorally inappropriate clients with cognitively intact individuals is counterproductive. Separate, equally appointed dining areas for disruptive clients and those engaged in restorative dining programs may be beneficial.

AUTONOMY

One's sense of autonomy influences overall health. Independence is developed over the years and is essential to mental health. The gradual deterioration in the body's physical condition that occurs with aging and chronic disease may limit this independence. For example, arthritic changes in the hands can make it difficult to hold eating utensils or to cut meat. But even with physical changes, people can maintain personal autonomy if they perceive themselves as having some control over their lives. In this example, the use of special utensils would promote independent eating and a sustained self-concept of independence.

Another example of maintaining personal autonomy is the diabetic client on a strict diet who finds ways to obtain whatever he or she wants to eat, thus illustrating the need to have control over one's life. Even in extended care facilities clients have ways of obtaining foods in addition to their recommended therapeutic meals, if it is their desire. Generally, clients have an increased likelihood of accepting their dietary restrictions if they are allowed to make choices and have some control over diet and food selection.

SPECIAL DIMENSIONS OF EXTENDED CARE AND ASSISTED LIVING FACILITIES

The special dimensions and needs of extended care facility clients differentiate this population from the approach to care taken in other health care settings. Emotional and mental needs of clients often take precedence over physical needs and significantly affect their quality of life.²

Decisions are often made for eating-disabled clients because it is assumed that they are unable to make choices or express preferences. Omnibus Budget Reconciliation Act of 1987 (OBRA) regulations for extended care facilities empower clients with the right to make choices and to express preferences including the choice of mealtime, table companions, and food preferences.⁸ (See Chapter 5.) Having the opportunity to make choices and express preferences is one simple, yet important way to help maintain a high level of functional health for all eating-disabled clients whether they live in their own homes, attend adult day care, or live in assisted living or extended care facilities.

Eating Dependency

Family, caregivers, and clients themselves often underestimate functional ability.⁵ Accurate assessment of functional ability is important because eating disabilities are common and increase among those older than 80 years. A recent study of 349 nursing facility clients noted mealtime difficulties in 87% of these individuals. The study also showed that 68% exhibited signs of dysphagia, 46%

had poor oral intake, 35% had positioning problems, and 40% exhibited challenging behaviors. An increased prevalence of mealtime difficulties was related to both the presence and degree of cognitive impairment. Many of these clients received partial to total feeding assistance.⁹

Future trends include the possibility of more mealtime difficulties because of the increasing number of older adults. Since the increased availability of home care and other community assistance programs has delayed admission into extended care facilities for many older adults, current caregiver training programs and staffing patterns need to be enhanced to meet the needs of this population.¹⁰

Dependency status with respect to eating has been correlated with the following:

- Impaired mobility
- Impaired cognition
- Consumption of modified consistency diets
- Presence of upper extremity dysfunction
- Absence of teeth or dentures
- Behavioral indicators
- Abnormal oral motor status

Dependency in eating has also been associated with mortality.^{11,12}

Caregivers' attitudes toward clients directly affect mealtime performance. They must be willing to offer the appropriate level of assistance or prompting because the type and amount of assistance provided has a significant impact on a client's ability to maintain independence and maintain nutritional health. Clients who receive too much assistance may gradually lose the ability to eat independently. Therefore, being aware of a client's skill level is important so that the caregiver can encourage as much independence as possible.

Clients benefit from an environment where they are encouraged to function at their highest physical and mental levels. Feeding oneself is vital for self-esteem. For clients who have temporarily lost the ability to eat independently, regaining independent eating skills enhances their sense of autonomy and self-concept. Even regaining partial skills, such as holding onto a glass and drinking independently or managing finger foods when skills for using utensils are lost, is equally important to maintain. Providing the opportunity and supporting the client in maintaining or rehabilitating eating skills are essential to avoid unnecessary loss of skills and subsequent loss of self-esteem.

According to OBRA regulations, clients in extended care facilities have the right to maintain or attain their highest practicable level of physical or mental well-being, not physically deteriorate beyond what is normal for their diagnosed condition. The facility is required to

maintain an environment to support independence. This mandate is appropriate for all care provided across the continuum.

Dining Room Atmosphere

The dining atmosphere is one of the most crucial aspects of a pleasurable dining experience; therefore, the physical dining environment should be attractive and functional, with the room as pleasant as possible. Tablecloths, napkins, flowers, and centerpieces go a long way toward setting the tone, especially in extended care facilities, assisted living facilities, adult day care centers, and congregate meal sites.

Care in painting and decorating the dining room is also essential. Painting the walls in light tones heightens vision, as does lighting that creates neither glare nor shadows. Using solid colors, rather than patterns, in wall and floor treatment enhances visual perception and decreases the possibility of visual confusion.

Putting only a few items on the table minimizes visual clutter and further enhances visual perception. Colorful dishes that contrast with the food enable the visually impaired to recognize items on the plate more easily. Tablecloths and placemats can provide additional contrast and thereby help clients locate dishes and utensils.

Distractions must be kept to a minimum. Television and radio should be off, although quiet background music may enhance the meal for those with unimpaired hearing. Announcements over an intercom system, conversations among staff members, and traffic flow through the dining room add to the distraction level. A calm, relaxed mood with minimal noise is an ideal dining atmosphere.

Encouraging clients to take time to get ready for the next meal heightens anticipation. In preparation for going to the dining room, men might shave and women put on makeup. Clients should be encouraged to come to meals dressed and with hair combed. Equally important is making sure each individual has the proper dentures, glasses, or hearing aids in place. At the table, the diner should be provided with a napkin that can be placed in the lap or tucked under the chin. A good napkin will replace the need for protective clothing. Attention to these details enhances the dining environment.

POSITIONING

Positioning provides the key for maximizing eating independence. Positioning provides the framework on which other interventions may be added to promote independence in eating and to make the client more comfortable during mealtimes.

The ideal eating position begins with the use of a standard dining room chair with arm rests for support.

While in the chair, the client can get close to the table by sliding the chair arms under the table. Being closer to the table is a key element in being independent with eating. The optimal position places the client's mouth approximately 12 inches from the plate. Ideally, the trunk will be upright, hips bent to a 90° angle at the back of the chair, head held upright and tilted slightly forward allowing direct visualization of the plate. The knees and ankles also need to form a 90° angle, with the feet planted squarely on the floor to maintain this position. When clients need additional support to maintain this upright positioning, they can rest their elbows on the edge of the table or a pillow may be placed in the side of the chair for trunk support. See *Figure 1* for correct mealtime positioning.

Figure 1



Wheelchair-bound Client

Even for the wheelchair-bound person, the use of regular dining room chairs should be encouraged instead of wheelchairs to facilitate the best mealtime positioning. Clients who generally use wheelchairs need to be encouraged to use dining room chairs at mealtime. Transferring from a wheelchair to a dining room chair allows for the additional benefit of position change. For clients who are unable or refuse to transfer from a wheelchair to a dining room chair for meals, proper positioning in the wheelchair is very important and should comply with the following parameters:

- The table may need to be elevated to allow the wheelchair to roll under the edge.
- The client must be within 12 inches of the plate.
- The wheelchair must be locked into position with the client's abdomen close to the table, hips at a 90° angle.
- The client needs solid support from the wheelchair seat and back, and foot support with foot rests or feet directly on the floor to help maintain the hips at a 90° angle.
- If the client cannot be positioned at the table, a lap tray attached to the wheelchair should be provided.
- Position the client to promote normal dining room conversation.

- Note that in extended care facilities, the lap tray may be considered a restraint even when used for positioning.

Poor Sitting Balance/Poor Neck Control

If a client who is seated at the table in a regular dining room chair has a tendency to fall forward from the waist with his or her head on the table, several techniques help maintain an upright position. First, the chair must be secure so that the client does not slide away from the table. (See *Figure 2*.) If the client's hips are sliding forward in the seat of the chair, the client's head tends to lean back and the distance from plate to mouth increases. With this increased distance, independence in eating becomes more difficult. The best position begins with the client's hips at a 90° angle at the back of the chair. A nonslip netting or other non-slip material on the seat of the chair helps prevent the

Figure 2



client from sliding forward. Avoid multiple layers of cushions on the chair seat since this can result in the hips sliding forward.

Second, if these interventions are unsuccessful, then a seat belt may be considered for use on the chair during mealtime. A seat belt would be used for positioning, but

would still be considered a restraint. Placement of the seat belt should allow the belt to come from under the chair and pass over the client's hips, not waist, to help keep the hips at the 90° angle at the back of the chair.

Bed-bound Client

Occupational and/or physical therapists can be a great resource in evaluating the client for positioning interventions. If the client cannot sit in a chair, the following positioning tips can be used for the bed-bound client.

- Raise the head of the bed to the fullest upright position.
- Position a pillow behind the client's shoulder blades and neck so that the neck is slightly forward and the chin is tucked under.
- Keep the head in a midline position.
- Maintain the head in an upright position to reduce the chances of aspiration.

Explore the Cause of Positioning Problems

Identify if the time of day contributes to more significant positioning problems. For example, if the client slides forward more frequently at the evening meal, could this be a result of fatigue? If so, perhaps one of these interventions will prove helpful:

- Have the client rest prior to mealtime.
- Bring the client to the table immediately prior to mealtime.
- Consider a schedule change to allow for maximum energy at mealtime.

- Position the knees at a 90° flexion by adjusting the bed or supporting the knees with pillows. (Additional pillows may be needed to maintain this position.)
- Reposition the client frequently to prevent pressure ulcers.

Additionally, remember to raise the bedside table and

position it close to the client. The table should be between waist and breast level to reduce the distance from plate to mouth. Also, close attention to the following improves positioning and promotes a positive mealtime experience:

- Clearing and cleaning the bedside table before serving the meal
- Placing all necessary items within reach
- Avoiding unpleasant smells
- Limiting distractions from visitors, loud TV, etc.
- Providing periodic supervision and assistance as needed

DYSPHAGIA

Dysphagia is defined as any problem encountered in chewing or swallowing food, beverages, or medications. Dysphagia is not a disease; instead, it is a symptom of an underlying condition that affects the swallowing process. Dysphagia is best assessed and treated under the direction of a speech-language pathologist.

Aspiration, which refers to foreign materials taken into the lungs, is the most serious health risk from dysphagia. Aspiration pneumonia generally results with symptoms of elevated temperature and fatigue. However, clients can aspirate foods and liquids without any external signs such as coughing, and the frail older adult may fail to have an elevated temperature. This condition is defined as silent aspiration.

Choking on Solids

The following interventions may be helpful for clients who choke on solids⁴:

- Position client upright with head tilted forward.
- Avoid tilting head past midline.
- Instruct client on small bite size and slow rate of eating.
- Offer small amounts of food slowly.
- Observe for swallow before introducing the next bite.
- Observe for possible pocketing.
- Avoid foods that are tough and hard to chew.
- Mix with gravy, sauces, or soup to moisten and hold food together if meat is ground or food crumbles easily.
- Pureed food should be of mashed potato, pudding, or applesauce consistency. Thin purees may cause additional problems and may be inadequate in nutrients.
- Use standardized procedures for food preparation.
- Reduce risk of aspiration by avoiding rushing; allow client 30-45 minutes to eat a meal.
- Serve food at appropriate temperatures (hot food hot and cold food cold) to help identify placement of food in mouth.
- Have client concentrate on eating, avoiding distractions in the dining area.
- Have client lower chin with each swallow.
- Keep client upright for 30 minutes after meal.

A speech-language pathologist can assist with evaluation of dysphagia and appropriate interventions to reduce risk of aspiration.

Choking on Liquids

The following interventions are helpful for clients who choke on liquids⁴:

- Position client upright, hips at 90° angle to back of chair.
- Have client concentrate on swallowing.
- Offer small amounts at a time.
- Avoid straws because liquids rush to the back of mouth before swallowing occurs.
- Avoid having client tilt head back when drinking.

General Warning Signs Indicating Swallowing Problems

- Coughing before, during, or after foods, liquids, or medications
- Swallowing three or four times with each bolus
- Clearing throat frequently
- Hoarse, breathy voice or gargly breathing
- Feeling of something caught or sticking in throat
- Drooling
- Pocketing of food in mouth
- Tongue thrusting repetitively from front to back

- Provide a “nose cut-out” cup.
- Instruct client to take a sip, hold in mouth, tuck chin to chest, swallow, lift chin, clear throat or cough lightly to clear remaining liquid from throat.
- Avoid serving thin liquids.
- Use naturally thick liquids such as tomato or vegetable juice, pear or apricot nectars, and milk shakes.
- Consider trial use of carbonated beverages as an alternative if client refuses thickened beverages. (Some studies showing less aspiration with a carbonated beverage as compared to thin liquids.¹²)
- Add commercial thickeners to liquids or purchase beverages already thickened. (**Note:** Thickened juices should be used only to reduce transit time; avoid thickening liquids unnecessarily.)
- Standardize procedures for food preparation.

Pocketing Food in Cheek

The following interventions are helpful for clients who have food pocketed or squirreled into one cheek:

- Allow ample time (30-45 minutes) for a meal.
- Position client upright with head slightly forward over plate.
- Avoid giving foods that fall apart (eg, dry ground meat).
- Use gravy or sauce to moisten and hold food together.
- Place food on side of client's mouth that doesn't pocket.
- Place small amounts of food in mouth at one time.
- Ensure that food is swallowed prior to offering next bite.
- Remind client to chew and swallow.
- Touch side of client's cheek to help client identify the presence of food in the cheek.
- Instruct client to move tongue to clear cheek or use a strong suck to move food to middle of mouth.
- Provide good oral hygiene after every meal.

REHABILITATION

Self-feeding is basic to one's sense of autonomy. Therefore, it is important for caregivers to encourage and stimulate clients' efforts toward independent eating by offering appropriate levels of assistance that have been identified by careful assessment of each client's eating ability. Once an independent eating level is identified, the client should be allowed and encouraged to use existing skills.

Hand-over-hand Assistance

Independent eating skills might include being able to hold a glass, direct the glass to the mouth, and drink independently. Caregivers may need to use verbal prompts to remind the client to pick up the glass and drink, or they may need to support the client's hand to help hold the glass and direct the glass to the mouth. This hand-over-hand assistance allows the client to continue to go through the motions of picking up the glass and directing the glass to the mouth, permitting less chance of losing this ability.

Hand-over-hand assistance can also be used to help the client eat with utensils. As the client becomes stronger or more independent, the caregiver needs to withdraw assistance gradually. For instance, in lieu of hand-over-hand assistance, the client might benefit from the assistance or support of the caregiver's hand under the forearm or at the elbow. Once the client has food on the eating utensil, the caregiver can help direct the filled utensil to the mouth by providing assistance at the client's elbow to lift and direct the arm. It is important not to provide more assistance than the client needs. To increase independence, gradually reduce the amount of physical assistance while using only verbal prompts to provide the required direction.

Verbal Cuing

Cognitively impaired clients capable of moving their hands to their mouths need to be involved in independent eating. These individuals may need only verbal prompting, or they may need prompting at every step of the eating process. The prompt might follow this sequence:

1. "(Client's name), pick up your spoon."
2. "Scoop some potatoes onto your spoon."
3. "Put the potatoes in your mouth."
4. "Swallow the potatoes."

When verbal prompting is unsuccessful, the caregiver should try hand-over-hand assistance.

Repetition is an essential element of rehabilitation. The same is true for maintaining or regaining independent eating skills. Repetition and consistent approaches are necessary, although several weeks may pass before progress is noted. Encouraging the client to use repetitive motions such as tooth brushing, face washing, hair combing, and shaving are helpful in the rehabilitation process since similar muscles are used for eating.

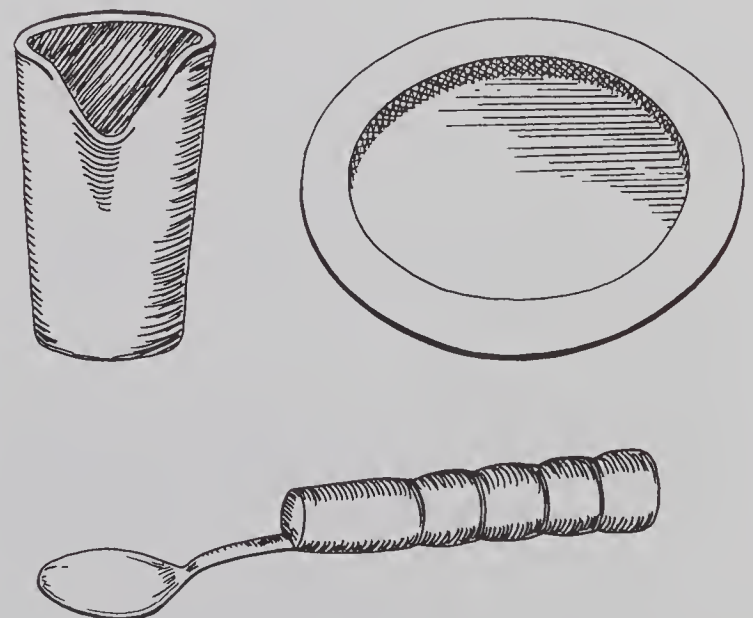
Adaptive Equipment

Adaptive measures are sometimes necessary for the client's comfort and independence. Adaptive equipment substitutes for motions lost because of disability. Before adaptive equipment and utensils are considered, the client's posture and positioning at the table must be addressed. Improved positioning at mealtime might eliminate the need for adaptive equipment.

A variety of adaptive equipment is available to facilitate independent eating. Large-handled utensils, nose cut-out glasses (nosey cup), inner lip plates, and large-handled travel mugs can be helpful. (See *Figure 3*.) Consult an occupational therapist for proper selection of adaptive equipment and utensils. (See *Box 1*.)

The entire health care team needs to be aware of the clients' eating abilities as well as the impact of meal service on their quality of life.¹³ A team approach is crucial in facilitating positive dining experiences. All caregivers play important roles to promote and maintain independent eating skills.

Figure 3



BOX 1: Adaptive Eating Aids⁴**Utensils**

- Large handled
- Built up handles available in varying widths
- Center hole sizes of foam tubing
- Gripper handles
- Bent or angled handle for lack of shoulder, elbow, or wrist motion
- Rocker knife for one-handed cutting
- Pizza cutter for one-handed cutting
- Weighted utensils to decrease hand tremors
- Long-handled utensils for poor arm (especially elbow) range of motion. Requires good coordination, arm and trunk stability.
- Nonslip material on utensil handle

Cups and Glasses

- Nosey or nose cut-out cup enables client to drink without bending head back
- Travel mug with large molded handle is helpful for clients who spill or have difficulty with small handles. Clients may more easily wrap their hands around this mug, plus a straw may be inserted through the hole in the cover.

Straws

- Flexible shafts bent to reach client's mouth
- Insert through hole in cover of mug.
- Use special straw holder clamped to glass.
- Useful for decreased range of neck motion or tremors
- Extra length available in flexible or rigid plastic
- Excellent for bed-bound or wheelchair-bound client using a beverage holder
- May need to be avoided for clients diagnosed with dysphagia

Plates

- Inner lip with raised edge for gathering food onto spoon is helpful for weakness or lack of coordination, impaired vision, use of only one hand.
- Plate guard that snaps on edge of plate

SUMMARY

This chapter points out the importance of each of the following elements when dealing with an eating-disabled client:

- Quality of life
- Special dimensions of dining atmosphere
- Autonomy
- Eating dependency
- Positioning
- Rehabilitation

Providing nutritious meals that meet individual food preferences served in a pleasant atmosphere that promotes socialization in a climate of friendship and respect has a positive impact on the quality of life. With older adults, providing these approaches may be more beneficial than offering only restricted therapeutic diets. Clients benefit from an environment where they are encouraged to function at their highest physical and mental level. Appropriate mealtime positioning promotes independence in eating. Monitoring for problems at mealtime and providing interventions can maximize the rehabilitation of the eating-disabled client.

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Care Planning/Discharge Planning

Developing an effective nutrition care plan for a client requires the dietetics professional to be cognizant of all aspects of the client's physiological, psychological, and sociological status. Previous chapters have provided the mechanisms to identify these factors. Identification and understanding of these factors culminate in designing a care plan.

In the integrated health care network of today's medical environment (ie, acute, subacute, extended care, and home care), some organizational differences exist, but the basics of care planning remain the same — to enhance the client's outcome and quality of life. As an integral member of the interdisciplinary health care team, the RD/DTR needs to share information from one setting to another to assist in the integration of the best nutrition services for the client who moves across the continuum of care. These services must offer recognized, cost-effective nutrition care protocols. (See Chapter 4.)

ACUTE/SUBACUTE SETTING

In the acute care setting, the length of client stay is usually very short, while subacute care requires a longer stay. The facility is required to follow the established standards of the accrediting agency whether the facility is Medicare-, Joint Commission on Accreditation of Healthcare Organizations (JCAHO)-, or Commission on Accreditation of Rehabilitation Facilities (CARF)-approved. Subacute units can be free-standing, within an acute care facility, or as part of a nursing facility. They are required to comply with the federal regulations emanating from the Omnibus Budget Reconciliation Act (OBRA) and/or JCAHO as applicable. Skilled nursing facility (SNF) residents in a Medicare-certified "swing-bed" (a hospital bed that is certified for both acute care and skilled

nursing, depending on the patient's need) hospital are not required to follow the Resident Assessment Instrument (RAI) protocols unless mandated by the state.^{1,2} In these facilities, the clinical/critical pathways system is often used to guide and coordinate the interdisciplinary care for clients. The RD/DTR must be an integral part of the health care team for the client to achieve the desired outcomes as established by the pathway.

Using the clinical/critical pathway system in acute/subacute facilities has resulted in shorter average length of stay (ALOS), which controls cost.

EXTENDED CARE

The Social Security Act, as amended by OBRA 1987, changed the total assessment process for all facilities certified to participate in the Medicare and Medicaid programs. This Act provided an opportunity to ensure good clinical practice related to assessing, planning, and providing individual care. The Resident Assessment Instrument (RAI), a regulatory framework, was created to recognize the importance of comprehensive assessment as the foundation for planning and delivering care to the client.^{4,5} The RAI must be completed for any client residing in the facility longer than 14 days (for example, clients of Medicare, Medicaid, hospice, short-term stay, or respite).

Initiated in 1998, Medicare reimbursement under the Prospective Payment System (PPS) for extended care facilities moved from a reimbursement system based on self-reported costs to one which imposes fixed rates of reimbursement on the facility. Rates are set based on the Health Care Financing Administration's (HCFA) Resource Utilization Groups (RUGs). It requires the dietetics professional to stay informed as to the most effective reimbursement for the client.^{3,6}

Clinical/Critical Events in the Designated Pathway that Aid the Average Client to Achieve the Desired Outcomes³

- Assessment
- Consultation to others
- Diagnostic tests
- Client education
- Treatment/procedures
- Evaluation and monitoring

HOME HEALTH CARE

Home health care services are provided through a variety of groups such as home health agencies, home health aide organizations, hospice, home infusion therapy companies, home medical equipment companies, and staffing agencies. (See Chapter 2.) In extended care, the Minimum Set (MDS) is the means of data collection, while in home health care the means of data collection is known as Outcome Assessment Information Set (OASIS). (See Chapter 4.) OASIS measures client outcomes in home health care. It is extensive but does not constitute a comprehensive assessment instrument. It is completed at the start of care and at follow-up points during the care (eg, every 60 days and at discharge).⁷

Like all other health care modes, home health care is required by regulations to have a system of clinical indicators in place for periodic monitoring and evaluation of client care. Clinical records must document client progress and outcome of care. Records are reviewed at least quarterly by “appropriate health professionals” within the agency. If registered dietitian services are provided, the RD should be included in the review process.

As in acute/subacute care, clinical/critical pathways are established for care planning.⁸ In home health care, they are referred to as clinical pathways, but the definition is the same. It is a road map or tool for coordinating clients’ interdisciplinary care. Following are the clinical events or processes — the guidelines for “average” client care — that must be followed to achieve the desired outcomes.

- Assessment (See Table 1.)
- Consultation/referral to another agency
- Diagnostic tests

- Patient education/self-management training
- Treatment/procedures
- Evaluation and monitoring

Benefits to be achieved by using the clinical/critical pathway are:

- Promotion of interdisciplinary collaboration and sharing of information about a client
- Enhanced quality and progression of client education and self-management skills resulting from a more thorough explanation of the treatment plan
- Comparison of outcomes of various treatment plans
- Assistance in identifying and reinforcing steps that are critical to achieving desired outcomes

In the home setting, the length of stay (LOS) may be increased, meaning the home health visits may be increased, but the impact on overall costs may be less if clients are taught self-management skills and are able to avoid admittance to a health care facility.

RESIDENT ASSESSMENT INSTRUMENT

The Resident Assessment Instrument (RAI) is a standardized approach for assessing, planning, and providing individualized care for the client in extended care facilities. It provides information on the client’s condition, tracks changes in the client’s status, and assists in the plan of care. The RAI provides a structured, standardized approach for applying a problem identification process in the extended care facility.

Components of the Resident Assessment Instrument (RAI)

1. Minimum Data Set (MDS)
2. Triggers
3. Resident Assessment Protocol (RAP)
4. Interdisciplinary Care Plan

TABLE 1: REQUIRED ASSESSMENTS⁶

Type of Assessment*	Timing of Assessment	Regulatory Requirement HCFA “F” Tag
Admission Assessment	Must be completed by 5th day of resident’s initial stay for SNF bed or 14th day for nursing facility bed.	42 CFR 483.20 (b)(4)(i)/F 273
Annual Reassessment	Must be completed within 12 months of most recent full assessment.	42 CFR 483.20 (b)(4)(v)/F 275
Significant Change in Status Reassessment	Must be completed by the end of the 14th calendar day following determination that a significant change has occurred.	42 CFR 483.20 (b)(4)(iv)/F 274
Quarterly Assessment	Set of MDS items, mandated by the state (contains at least HCFA-established subset of MDS items). Must be completed no less frequently than once every 3 months.	42 CFR 483.20 (b)(5)/F 276

* These parameters are subject to change at any time.

MINIMUM DATA SET^{5,6}

The Minimum Data Set (MDS), used in the client assessment and care planning process, is a fundamental set of criteria needed to adequately assess a client's functional status. The dietetics professional must use several information sources to complete the assigned sections of the MDS. These include:

- Observation and interview of the client
- Interview with professionals and other staff
- Discussion of client's status with the physician
- Discussion of client's status with family member(s)
- Review of client's records

The dietetics professional should examine the entire MDS thoroughly because it reveals much about the client.

The MDS is subject to specific completion deadlines that affect a SNF's payment. The MDS completed by day 5 sets the rate for the first 14 days of care; the 14-day MDS sets the rate for days 15 through 30; the 30-day MDS sets the rate for days 31 through 60; the 60-day MDS sets the rate for days 61 through 90; and the 90-day MDS determines the rate for the last 10 days of a 100-day stay. (Because the time schedules for completion, reporting, etc. of the MDS are subject to change, regular review of federally mandated guidelines is strongly recommended.)

The dietetics professional who completes any section of the MDS must sign, date, and indicate the portion of the assessment completed. It is the facility's

responsibility to ensure that all participants in the assessment have the requisite knowledge to complete an accurate and comprehensive assessment. The RN coordinator is required to sign to certify that the MDS is complete.⁴

All completed MDS sheets are a part of the client's record. Facilities are required to maintain 15 months of assessment data in the client's active clinical record. Other, older records must be easily retrievable.

The MDS is begun shortly after admission and completed within 5 days of admission. An annual reassessment must be completed within 12 months of the most recent full assessment. An MDS must also be completed after a significant change (two or more areas of decline or improvement) occurs. (See *Box 1*.) Generally, if the significant change is not resolved within approximately 2 weeks, a comprehensive assessment should begin. A review must be completed no less than every quarter. Upon readmission with a change in condition, a

full MDS is conducted; with no change in condition, a full MDS is not necessary.

MDS Areas for the Dietetics Professional to Review

- Advanced directives
- Cognitive patterns
- Communication/hearing patterns
- Psychological well-being
- Physical functioning and structural problems
- Disease diagnosis
- Health conditions
- Skin condition
- Medication
- Special treatment and procedures
- Discharge potential and overall status

TRIGGERS

Triggers are specific client responses for one or a combination of the MDS elements. The triggers identify the clients who have, or are at risk of developing, specific functional problems which require further evaluation using the Resident Assessment Protocol (RAP).⁴ (See *Box 2*.)

BOX 1: Significant Change

Definition:

- Is not self-limiting
- Impacts more than one area of the resident's health status
- Requires interdisciplinary review or revision of the care plan

Significant changes can include:

- Emergence of sad or anxious mood patterns as a problem that is not easily altered
- Emergence of a pressure ulcer at Stage II or higher, when no ulcers were previously present at Stage II or higher
- Occurrence of an unplanned weight loss (5% change in 30 days or 10% change in 180 days)
- Overall deterioration of the client's condition, and client requires more support services

BOX 2: Triggers

There are four types of triggers.

1. **Potential Problems:** Those factors that suggest the presence of a problem that warrants additional assessment and consideration of a care plan intervention (eg, pressure ulcer).
2. **Broad Screening Triggers:** Those factors that assist staff to identify hard-to-diagnose problems (eg, dehydration).
3. **Prevention of Problems:** Those factors that assist staff to identify residents at risk of developing particular problems (eg, weight loss).
4. **Rehabilitation Potential:** Those factors that identify candidates with rehabilitation potential (eg, resident believes he can feed himself).

The Trigger Legend (a two-page form) summarizes which MDS item responses trigger individual RAPs. This is considered a worksheet and is not required to be maintained in the client's record. If relying on a software program to trigger the RAPs, be sure the definition triggers the RAPs correctly.

Resident Assessment Protocols

The RAPs are problem-oriented frameworks for additional assessment based on problem identification items (triggered conditions). Triggers target conditions for additional assessment and review through the RAPs. They form a critical link to decisions about care planning. The RAP synthesizes assessment information within a comprehensive assessment. RAP guidelines help staff evaluate trigger conditions. The dietetics professional needs to be familiar with all triggers, but especially with nutritional status, feeding tubes, dehydration/fluid maintenance, dental care, and pressure ulcers.

Each RAP has four parts:

1. Problem
2. Triggers
3. Guidelines
4. RAP key (summary and sometimes clarification of guidelines)

The RAP summary form sums up the interdisciplinary team's decisions as to whether or not to proceed with a care plan intervention. Documentation of problems, complications, risk factors, or the need for referral to the appropriate health professional is found throughout the client's chart. The location of this information

should be noted on the RAP summary sheet so that others reviewing the data can readily find justification for the decision.

The following examples illustrate when the interdisciplinary health care team may not proceed to care planning from a triggered RAP.

1. **Dehydration:** Client does not consume all fluids provided. The dietetics professional calculates fluid requirements and can justify that the client does not need to consume all fluids provided. For example, client calculated needs are 1,200 mL or 30 mL/kg, but the client received 1,000 mL daily. Client shows no signs or symptoms of dehydration.
2. **Nutrition:** Client leaves more than 25% of food uneaten. The dietetics professional documents that this 100 lb, 90-year-old woman consumes only 50% of most meals. The dietetics professional calculates an average of 1,800 kcal to 2,000 kcal in the regular diet. If the client's basal energy expenditure (BEE) and total daily expenditure (TDE) have been calculated, the justification can note that this client does not need the calories provided in the regular diet if no weight loss is occurring. Small portions may be recommended. However, even if this is not addressed on the overall plan of care, it must still be addressed in the nutrition progress notes so that all members of the team are aware of the decreased overall intake.
3. **Mechanically Altered Diet:** The dietetics professional documents that a client requires ground meat because she refuses to wear dentures after having them realigned and readjusted. The client continues to request ground meat, consumes 75% of this food group, and shows no weight loss or signs of nutrition problems related to texture modification. Again, this would be covered in the progress notes, but progression to the care plan is not necessary.

During this phase of the process, the team begins to develop the overall plan of care. Comprehensive care plans must be developed and reviewed within 7 days of completion of the RAI. The care plan must address the medical, nursing, and psychosocial needs identified in the assessment.

Interdisciplinary Care Plan

Care plans are implemented in all areas of the health care continuum and encourage an integrated approach involving the client, facility staff, the client's family or guardian, and the physician. The care planning process involves four steps^{9,10}:

1. Assessment:
 - Identifying the client's strengths and weaknesses
2. Planning:
 - Formulating problem/needs statements
 - Developing measurable goals
 - Planning intervention/approaches
3. Implementation
4. Evaluation and reassessment

The goal of care planning is to develop a course of action designed to maintain or return the client to the best possible state of health. The dietetics professional develops the nutrition component of the care plan using the facility's interdisciplinary format. In general, each client's care plan includes the following^{9,10}:

- Problems or needs that must be addressed to attain and maintain the client at the highest practicable physical, mental, and psychosocial well-being
- Realistic goals, in terms of client understanding, if possible. Goals must be realistic and measurable, stated in terms of expected behaviors, changed as the client's condition changes, have an anticipated date of completion or attainment, and designate responsibility.
- Interventions/approaches to solve problems and satisfy needs. These must state what is to be done and by whom for each specified problem. In describing an intervention, avoid words such as "encourage," "understand," or "reassure." Each statement should start with a verb such as "provide a cup with a large handle and teach client how to use it to reach the goal of self-feeding and drinking."
- Implementation carried out as stated on the care plan. It is essential that the timing, repetition, and sequencing be followed precisely by the designated persons to ensure consistency of implementation.
- An evaluation/reassessment of the client, an essential part of the care plan
- A discharge plan developed in accordance with facility protocol

The care plan is a part of each client's medical record. It must be accessible to all who are involved in the care of the client, including the client and the client's family or guardian. It is reviewed regularly to ensure that the approaches to improve or maintain the client's

state of health are effective. The simplest terminology possible should be used in writing the care plan to ensure that all members of the team understand the plan.

Implementing the Care Plan

One of the most effective methods for planning client care is the interdisciplinary team conference which offers an excellent opportunity to develop a coordinated plan for each client. It allows each discipline to share assessments and gain a greater understanding of the total needs of the client. It is advisable that all the disciplines meet as a team at regularly scheduled intervals.

Each discipline should come to the conference prepared to share assessment data because much can be learned by carefully listening to and questioning other team members. Since the conference is usually prescheduled, the dietetics professional can prepare by collecting and updating the nutrition assessment data and developing tentative plans for dealing with the problem(s) identified.

Team cooperation is particularly important since implementing the goals often involves more than one discipline. For example, if one of the goals is weight loss, the RD develops a personalized diet plan and counsels the client; the dietetic technician or dietary manager makes sure the food is served correctly and offers support; the activities director plans activities to increase the client's energy expenditure to include an exercise program commensurate with the client's physical health; and the nursing staff provides support and reinforcement to the client.

Nursing often is the appropriate discipline to chair the interdisciplinary team conference because of frequent contact with the other disciplines. However, the physician has ultimate responsibility for the health care of the client and may be invited to the team conference but generally is not asked to chair the team.^{9,10}

Following the interdisciplinary team conference, the RN or chair of the team follows up with written information such as the suggestions and recommendations made by the various disciplines present at the conference. The nutrition care recommendations most often will be found in the progress summary of the assessment and will have been discussed during the team conference. If the RD is unable to attend the care conference, the recommendations should be disseminated at the interdisciplinary team conference by the dietetic designee, the diet technician or dietetic manager who signs the plan.

The facility is ultimately responsible for the overall care of its clients including their nutrition care.

Monitoring and Evaluation

The RD reviews the care plans of clients at risk. Any problems with omission of nutrition goals or approaches must be corrected immediately. Nutrition-related problems that might trigger such an action include, but are not limited to, the following:

- Impaired skin integrity (making sure all areas with impairment are listed individually with the problem)
- Enteral or parenteral feeding regimens
- Unexplained weight changes (+/–)
- Renal dysfunction
- Unstable diabetes mellitus
- Increases in self-care deficits, especially quality of life issues such as rehabilitative feeding

Documentation and evaluation are integral parts of the process to implement the goals and approaches established in the interdisciplinary team conference. Evaluating the care plan and determining whether goals have been met are both important. If the goals have not been accomplished, the following questions should be asked⁴:

- Was this really a problem for the client?
- Was the goal realistic?
- Was the goal stated in measurable terms?
- Did the intervention help the client achieve the goals?
- Was the time frame realistic?
- Was the intervention realistic?
- Was the intervention carried out as listed?
- Was the appropriate discipline identified for each intervention?

Answers to these questions should help identify deficiencies in the plan and guide staff in correcting them. Remember, write care plans in the simplest terminology to ensure that all members of the team understand the plan. A written plan that is understood only by professionals is of limited value.⁹

The care plan is a permanent part of the legal medical record. Failure to identify and include a client's nutrition needs in the care plan can be construed as professional neglect or lack of expertise on the part of the dietetics professional.

DISCHARGE PLANNING

Discharge planning is an important activity in any health care setting. It identifies what happens to the client

before he or she can be safely discharged. The options at discharge should appear in the plan of care. Reasons for discharge planning include the following:

- Need to design written diet instructions that are required for reference and reinforcement
- Need to contact nutrition support programs in advance and make arrangements for home-delivered meals
- Need to provide a source of dietary information on nutrition status, explaining the degree of and the client's response to nutrition intervention to other health care facilities where the patient is to be placed after discharge. This information can save the admitting facility time and prevent it from trying approaches that were previously unsuccessful. The nutrition discharge summary also can highlight a problem such as weight loss that might not be readily apparent to the admitting facility.
- Need to provide opportunity to reinforce the principles of nutrition learned while the client was in the facility. Clients returning to the home setting have a written reminder of the nutrition services offered by the facility.
- Need to provide appropriate information to facilitate the client's adjustment to another environment.

A summary of the client's nutritional status and problems while in one facility is valuable information for the facility that receives the client and helps the dietetics professional develop an effective nutrition care plan sooner than would be possible otherwise.¹⁰ It also provides continuity of care and may, therefore, enhance the client's quality of life.

COMPUTER PROGRAMS

Due to the complexity of the resident assessment process, health care facilities have been mandated by HCFA to computerize the MDS, RAPs, and other assessment data¹¹. Desirable requirements of the selected computer program include the following:

- Changes in client needs or conditions can be easily updated.
- Information in the database can be cross-referenced for interdisciplinary care planning.
- Predefined, standardized formats and care plan options can improve organization and save time.
- The ability to revise specific care plan options for the individual is available.

- Manual updating or reproduction of the current MDS form information is eliminated.
- All MDS forms are maintained in a history file, and current MDS assessments are always on file.
- The triggered RAPs can be matched against the trigger definitions to make sure the RAPs have been correctly identified.
- The care plan is quickly and easily produced using speed processing and the automatic incorporation of the RAPs and guidelines based on the client's MDS assessment.
- Comparison reports are generated to ensure consistent and complete follow-up documentation.

Background

Nursing homes are required to encode the MDS in a machine-readable format and transmit the MDS in a standardized format in accordance with specifications provided by HCFA. Nursing homes transmit MDS data to a state agency (or agent of the state), which is responsible for editing and cleaning the data prior to transmission to a national repository maintained by HCFA.

HCFA published MDS 2.0 in its *State Operations Manual*⁵ in April 1995. In addition to a substantially revised MDS, HCFA has also issued new RAP triggers, which contain changes in clinical logic as well as in item labels corresponding to the revised MDS.

Each state must respecify the RAI that nursing homes will be required to use. At a minimum, each state's new RAI will consist of at least the MDS 2.0 and HCFA's RAPs. States no longer are able to intersperse or rearrange items within the body of the MDS. Any state-required items will be placed under Section S, which has been designated for state use in version 2.0. Except for Section S, exactly the same items must occur in the same order in every state.

Facilities can meet HCFA regulations for automated submission of MDS 2.0 by using a contract service to encode MDS data according to standard specifications. However, most facilities have obtained software products and computerized systems to perform these functions in-house. Neither software products nor contract services are reviewed or regulated at the federal level, nor does HCFA require states to perform this function. However, there is a strong incentive to acquire and use only those products or services that are capable of satisfying all federal- and state-specific requirements.

Prior to acquiring an appropriate computer program, facilities should seek assurances from the software vendor or contract service that testing has demonstrated compliance with these regulations. Similar assurances should also be obtained whenever changes are made to programs or services. The failure of a computer program or contract service does not obviate the nursing home's responsibility to comply with the MDS automated submission regulations.

HCFA has published national standards regarding record types, data specifications for each record type, RAP triggers, and test files. Regulations related to data transmission from the nursing home to the state must be constantly reviewed. This information and subsequent updates are available electronically through a HCFA Internet site at www.hcfa.gov/medicare/hsqb/mds20/. (See *Box 3*.)

HCFA strongly encourages facilities to move beyond simply satisfying MDS regulations and adopt innovative solutions to using MDS data to meet the needs of clinical staff responsible for providing resident care and monitoring quality. The MDS offers a very rich data source with several additional and valuable automation possibilities.

SUMMARY

Medical nutrition therapy (MNT) is an integral part of health care in all settings. Part of this process is care planning which crosses the entire continuum of care. This procedure is basically the same in all settings. The four steps required to achieve the desired outcome for the client are assessment, planning, implementation, and evaluation/reassessment. The dietetics professional is an integral part and plays a major role on the interdisciplinary health care team, but the registered dietitian is the expert in all aspects of nutrition care.^{12,13}

BOX 3: Nursing Home MDS Responsibilities

- 1. MDS 2.0 information is privileged resident information and access must be secured.**
 - Access to the MDS records for residents, whether those records are hard copy or electronic, must be secured in compliance with HCFA requirements for safeguarding the confidentiality of clinical records.
 - In most cases, access to electronic MDS records should incorporate standard user ID and password techniques.
- 2. All required MDS items must be completed and electronically encoded.**
 - In all states, the facility is required to complete and electronically encode all of the following MDS records: admission assessments, annual assessments, significant change assessments, significant correction assessments, quarterly review assessments which include a subset of the MDS items, discharge records, and reentry records.
 - The electronic encoding must include the MDS items on the MDS forms, information from the Resident Assessment Protocol Summary (Section V), plus several control items not included on the form (see the Control Section in the "Data Record Layout" available on the University of Wisconsin Web site (www.wvm.edu)). The Control Section includes items such as the date that the electronic record was locked, the version of the MDS completed, and the software used to encode the MDS.
 - The facility must also complete and encode any additional items required by a particular state (Section S). Record specifications for each state's Section S must be obtained from each state.
 - When required in a particular state, the facility must also complete and encode the special MDS+ sections (Sections T and U).
 - When required in a particular state, the facility must also complete additional assessments according to state-established timeframes (eg, 5-day assessments, 30-day assessments, 60-day assessments, quarterly assessments which include all MDS items, readmission assessments, and any other state-required assessments).
- 3. Electronic completion of the MDS 2.0 must conform to the general rules for completing the MDS.**
 - The electronic encoding regulation for the MDS 2.0 can be fulfilled in one of two ways: (1) the standard MDS 2.0 paper forms can be completed by assessors and then electronic data entry can be performed from these paper forms, or (2) the MDS 2.0 item responses can be directly entered "real-time" into an electronic record by the assessor without completing a paper form.
 - Systems allowing real-time completion of assessment, discharge, and reentry forms must provide display of the MDS items and response choices with the same wording as the paper forms. Items must be completed using the same definitions as found in the *Long-Term-Care Resident Assessment Instrument User's Manual: Version 2.0*.
 - When completed real-time, each item for each required assessment, discharge, or reentry must be reviewed by the assessor. Software must provide the opportunity for the assessor to review the previous response for each item and to select a new response if appropriate. Automatic copying of previous records or other source documents without item-by-item review by the assessor is not acceptable.
 - When completed real-time, the same assessment reference date must be used for each item. Also, the appropriate observation period must be used for each item. For example, activities of daily living (ADL) self-performance items (items G1aA through G1jA) must indicate resident performance "over all shifts during the last 7 days."
 - When a required MDS assessment is completed real-time, a static copy of the MDS must be produced as part of the resident's clinical record (see #10 below). This static copy must be "locked" within specified timeframes (see #7 below) and cannot be changed after "locking." The "locked" copy must be maintained for the required retention intervals (see #10 below). Correction of errors in a "locked" assessment is not

continued

BOX 3: Nursing Home MDS Responsibilities

allowed. If errors are discovered in a “locked” record, then a new significant change or significant correction assessment is required. For a more complete discussion of the correction of errors in an MDS assessment, see Section 2.7 of the *Long-Term-Care Resident Assessment Instrument User's Manual: Version 2.0* or the document entitled “Correction of Errors and Locking of Records for the Minimum Data Set (MDS) 2.0” available on the University of Wisconsin Web site.

4. MDS data items submitted by the facility must conform to range and consistency standards.

- The values encoded for every MDS item and every required Control Section item must fall within the allowable response ranges given in the “Data Record Layout” available on the University of Wisconsin Web site. Software or contract services should produce MDS records with all items falling within allowable ranges.
- The values encoded for all MDS items and all required Control Section items must conform to the consistency requirements given in the “Data Record Layout” available on the University of Wisconsin Web site. Software or contract services should produce MDS records with all items conforming to these consistency requirements.
- Facilities are required to ensure that all MDS records pass required edits prior to locking and transmission to the state. Therefore, it is strongly recommended that MDS software and automation services be able to run standard range and consistency edits on electronic MDS data records and report any discrepancies to the facility.

5. MDS assessments must be completed according to specific sequencing and timing requirements.

- MDS assessments must be performed in specific sequences and must conform to specific timing requirements.
- Federal timing requirements include (1) a full assessment must be completed by day 14 and locked by day 21 after initial admission, (2) an annual full MDS reassessment must be completed within 12 months of the most recent full assessment, (3) quarterly review MDS assessments involving a subset of the MDS items must be performed in each 3-month period in which a full assessment is not performed, and (4) a full significant change MDS assessment is required when there is a “significant change” in resident status. See Section 2.4 of the *Long-Term-Care Resident Assessment Instrument User's Manual: Version 2.0* for a more detailed description of these types of assessments. Note that item AA8a indicates the types of federally mandated assessments.
- The state may mandate additional or more frequent requirements. Relevant requirements must be obtained from each state. Note that item AA8b indicates the types of state-mandated assessments.
- Sequencing requirements refer to the order in which various MDS assessment, discharge, and reentry forms are dated. These requirements are based on logic concerning the possible sequence of assessment events. For example, the earliest MDS form for a resident must be an admission assessment; a reentry form must be preceded by a discharge form without an intervening assessment form; an assessment form cannot be preceded by a discharge form without an intervening reentry form, etc.
- It is recommended that MDS software and automation services be able to run standard sequence and timing edits on electronic MDS data records and report any discrepancies to the facility.

6. Resident Assessment Protocol (RAP) status and care planning decisions must be encoded.

- The facility is required to encode which RAPs are triggered and the care planning decision (ie, whether a care plan has actually been developed) for each of the 18 RAP problem areas into Section V, the “Resident Assessment Protocol Summary,” of specified electronic MDS assessment records. For example, if Rap 01 (Delirium) is triggered, then a “1” must be encoded for item VA01a. If RAP 01 is not triggered, then a “0” must be encoded for item VA01a.
- Regardless of whether RAP 01 is triggered or not, the care planning decision for that RAP must also be encoded in item VA01b with a “1” indicating that the clinical condition covered by that RAP is addressed in the care plan and a “0” indicating that the RAP area is not addressed in the care plan. Note that a care

continued

BOX 3: Nursing Home MDS Responsibilities

plan may be appropriate and developed for a RAP problem area, whether the RAP has actually been triggered or not.

7. MDS assessments must be closed and electronic records locked according to specific requirements.

- MDS assessments completed on paper must be closed according to specific HCFA requirements (see Section 2.7 of the *Long-Term-Care Resident Assessment Instrument User's Manual: Version 2.0*). When a paper assessment record has been closed, corrections cannot be made to that record. A discussion concerning the facility's options for correcting MDS errors is also given in Section 2.7 of the *Long-Term-Care Resident Assessment Instrument User's Manual: Version 2.0* and duplicated in the document "Correction of Errors and Locking of Records for the Minimum Data Set (MDS) 2.0," available on the University of Wisconsin Web site.
- It is necessary that MDS software, allowing real-time completion of MDS records, lock records within the timeframes specified by HCFA (see Section 2.7 of the *Long-Term-Care Resident Assessment Instrument User's Manual: Version 2.0*). There are several steps involved in the "locking" process. First, the RAI clinical assessment process must be completed within required timeframes (eg, the MDS and RAPs must be completed within 14 days after admission). Facilities must have completed the information on the RAP Summary form (Section V) under the columns "(a) Check if triggered" and "Location and Date of RAP Assessment Documentation" within required timeframes for completion of the RAI. Facilities then have an additional 7 days to ensure that the MDS meets established range and consistency edits. During this 7-day period, MDS item responses may be changed in order to comply with the edits. The MDS electronic record is then considered "locked." In terms of the clinical process, the RAP Summary form column, "(b) Care Planning Decision — Check if addressed in care plan," should not be completed until after the care planning process has been completed by the interdisciplinary team (ie, within 7 days of completion of the RAI). Section V of the electronic record is entered and locked on completion of the clinical care planning process.

8. Facilities must assemble MDS records in a specified ASCII format for submission to the state.

- MDS records required to be submitted to the State must conform to a specific ASCII layout and be incorporated into files with "header" and "trailer" records conforming to required ASCII layouts (see the documents "Data Record Layout," "Header Record Layout," and "Trailer Record Layout" available on the University of Wisconsin Web site).
- Any MDS data entry or "real-time completion" software must be able to export all required records in the standard ASCII format specified in the "Data Record Layout" document. Only locked records may be submitted. The software must have the provision to re-export a set of previously exported records to allow recovery in the event of loss of exported records.

9. Facilities must submit all required MDS records to the state.

- The methods required for submitting electronic MDS records currently vary from state to state. Some states provide communication software to facilities, while others require that facilities use proprietary, generic software to submit data. In either case, it is advantageous if MDS software or automation services retain submission files until the files have successfully been received by the State.
- In states providing communication software, facility support for communication and/or transmission problems are usually provided by the state.
- In states not providing communication software, facilities often must obtain communication or transmission support for such software on their own. In such states, it may be advantageous if the MDS software vendor or automation service used by the facility provides support for such problems. In such states, it is also advantageous if the MDS software vendor or automation service can provide support to the facility with regard to reception of electronic feedback from the state concerning the successful reception of data,

continued

BOX 3: Nursing Home MDS Responsibilities

problems with data transmission, and errors (range, consistency, sequence, and timing errors) in data received by the state.

- HCFA is currently in the process of defining uniform federal requirements for submission of MDS records by all nursing homes in the nation. These federal requirements will be published well in advance of the mandated implementation date. Each nursing home will be required to submit electronic MDS records to its respective state. The impact will be to standardize submission requirements in states already requiring submission and to initiate submission in all of the other states.

10. Facilities must retain a copy of required MDS records as part of the clinical record for a resident.

- The MDS is considered part of the clinical record and must be maintained on a resident's clinical record. Specific requirements about retention of MDS assessment data are given in Section 2.5 of the *Long-Term-Care Resident Assessment Instrument User's Manual: Version 2.0*. In general, MDS data must be retained on the active clinical record for a 15-month period.
- In facilities where the MDS assessments are completed on paper forms, a single hard copy, either a paper copy or a printout, must be stored in the clinical record. An electronic MDS record submitted to the state must exactly correspond to the paper copy in the clinical record. To allow verification of the electronic record, the MDS software or service used to encode the MDS assessments into electronic records must allow a hardcopy printout of the electronic record to be made. The printout of the electronic record can then be verified against the original paper form.
- In facilities with paperless clinical records (ie, all clinical records are electronic), the following requirements apply:
 - The system must maintain 15 months of assessment data according to HCFA policy and must be able to print all assessments for that period upon request. Printouts must be replicas of the required forms. Items must be on the same pages and in similar positions as on the required forms, with any additional information being printed in otherwise blank margins or on additional pages. The data presented on printouts must exactly correspond to the data in the locked electronic records.
 - The facility must have a back-up system to prevent data loss or damage.
 - The information must always be readily available and accessible to staff and surveyors. Finally, the system must comply with HCFA requirements for safeguarding the confidentiality of clinical records.

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1

APPENDIX

Common Medical Abbreviations

Abbreviation	Meaning
abd	abdomen
ABG	arterial blood gas
abs	absorption
ac	before meals
ACHC	Accreditation Commission for Home Care
ACVD	arteriosclerotic cardiovascular disease
ad lib	as desired
ADA	The American Dietetic Association
ADD	attention deficit disorder
ADHD	attention-deficit hyperactivity disorder
ADL	activities of daily living
adm	admitted or admission
AHCPR	Agency for Health Care Policy and Research
AIDS	acquired immunodeficiency syndrome
AIR	acute inflammatory response
AKA	above-knee amputation
Al	aluminum
Alb	albumin
ALD	alcoholic liver disease
ALOS	average length of stay
ALP	alkaline phosphate
ALS	amyotrophic lateral sclerosis
AM	morning
AMA	against medical advice
amb	ambulatory
AMDA	American Medical Directors Association
amt	amount
APAP	acetaminophen
approx	approximately
as tol	as tolerated
ASA	aspirin
ASAP	as soon as possible
ASBS	arteriosclerotic brain syndrome
ASHD	arteriosclerotic heart disease
ATP	adenosine triphosphate

Abbreviation	Meaning
BEE	basal energy expenditure
bid	twice daily
BKA	below-knee amputation
BM	bowel movement
BMI	body mass index
BMR	basal metabolic rate
BP	bathroom privileges
BUN	blood urea nitrogen
c	with
C	centigrade, Celsius
c/o	complains of
Ca	calcium
CA	cancer
CAD	coronary artery disease
cal	calorie
cap	capsule
CARF	Commission on Accreditation of Rehabilitation Facilities
CBC	complete blood count
CBR	complete bed rest
CBW	current body weight
cc	chief complaint
CCRC	continuing care retirement centers
CCU	coronary/critical care unit
CD-HCF	Consultant Dietitians in Health Care Facilities
CDE	Certified Diabetes Educator
CF	cystic fibrosis
CHD	coronary heart disease
CHF	congestive heart failure
CHF	coronary heart failure
CHO	carbohydrate
Chol	cholesterol
Cl	chloride
cm ³	cubic centimeter
CNS	central nervous system

Abbreviation	Meaning	Abbreviation	Meaning
conc	concentrate	FPG	fasting plasma glucose
COPD	chronic obstructive pulmonary disease	func	function
CP	cerebral palsy	FVC	forced vital capacity
CQI	continuous quality improvement	Fx	fracture
CRF	chronic renal failure		
CVA	cerebrovascular accident (stroke)	g or gm	gram
CVD	cardiovascular disease	g-tube	gastrostomy tube
CVI	cerebrovascular insufficiency	G6PD	glucose-6-phosphate dehydrogenase
		GAS	generalized arteriosclerosis
DASH	Dietary Approaches to Stop Hypertension	GB	gallbladder
DAT	diet as tolerated	GDM	gestational diabetes mellitus
DC	discontinue	GERD	gastroesophageal reflux disease
def	deficiency	GI	gastrointestinal
DIC	disseminated intravascular coagulation	Glu	glucose
DJD	degenerative joint disease	gtt	drops
dL	deciliter	GTT	glucose tolerance test
DM	diabetes mellitus		
DON	director of nursing	h or hr	hour(s)
DOQI	Dialysis Outcomes Quality Initiative	H ₂ O	water
DPGs	dietetic practice groups	HCFA	Health Care Financing Administration
DTR	dietetic technician, registered	Hct	hematocrit
DVT	deep vein thrombosis	HCTZ	hydrochlorothiazide
Dx	diagnosis	HCVD	hypertensive cardiovascular disease
DXA	dual-energy x-ray absorptiometry	Hcy	homocysteine
		HD	hemodialysis
ECF	extended care facility	HDL	high-density lipoprotein
ECG (EKG)	electrocardiogram	HEDIS	Health Plan Employer Data and Information Set
EFA	essential fatty acids	Hgb	hemoglobin
eg	for example	HHA	home health agencies
EPO	erythropoietin	HIV	human immunodeficiency virus
EPS	extrapyramidal symptoms	HMO	health maintenance organization
ER	emergency room	2hPG	2-hour plasma glucose
ESRD	end-stage renal disease	hs or HS	hour of sleep
et	and	HTN	hypertension
ETOH	ethanol	Hx	history
exam	examination	hyper-	above, excessive
		hypo-	less than, below
F	Fahrenheit		
F/C	Foley catheter	I&O	intake and output
FBS	fasting blood sugar	IADL	instrumental activities of daily living
FDA	Food & Drug Administration	IBW	ideal body weight
Fe	iron	IDDM	insulin-dependent diabetes mellitus
FEV1	forced expiratory volume in 1 second	IFG	impaired fasting glucose
ff	force fluids	IGT	impaired glucose tolerance
FH	family history	IM	intramuscular
fld	fluid	INH	Isoniazid
Fol	folic acid or folate		

Abbreviation	Meaning
-itis	inflammation of
IU	intravenous units
IV	intravenous
j tube	jejunostomy tube
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
JET-PEG	jejunal extension tube
K	potassium
kcal	kilocalorie
kg	kilogram
L	liter
lab	laboratory
lb	pound
LD	liver disease
LDL	low-density lipoprotein
liq	liquid
LOS	length of stay
LSOA	The Longitudinal Study of Aging
lt or L	left
LT	long term
MAO	monoamine oxidase
MAOI	monoamine oxidase inhibitors
MCH	mean corpuscular hemoglobin
MCHC	mean corpuscular hemoglobin concentration
MCO	managed care organizations
MCT	medium-chain triglyceride
MCV	mean corpuscular volume
MDRD	Modification of Diet in Renal Disease
MDS	Minimum Data Set
meds	medication
meq or mEq	milliequivalent (23 mg Na = 1 mEq)
mg	milligram
Mg	magnesium
MI	myocardial infarction (heart attack)
MID	multi-infarct dementia
min	minute(s)
mL	milliliter
MMA	methylnalonic acid
Mn	manganese
MNT	medical nutrition therapy
mod	moderate
MOM	milk of magnesia

Abbreviation	Meaning
MOS	Medical Outcomes Study
mOsm	milliosmole
MRDD	mentally retarded developmentally disabled facilities
MS	multiple sclerosis
MVI	multivitamin
n/c	no complaint
N & V	nausea and vomiting
N	nitrogen
N/V	nausea/vomiting
Na	sodium
NCHS	National Center for Health Statistics
NCQA	National Committee for Quality Assurance
neg	negative
ng	nanogram
NG tube	nasogastric tube
Nia	niacin
NIA	National Institute of Aging
NIDDM	non-insulin-dependent diabetes mellitus
NKA	no known allergies
NKFA	no known food allergies
nl	normal
NLHI	National Library of Health Care Indicators
noc	night
NPO	nothing by mouth
NPUAP	National Pressure Ulcer Advisory Panel
NSAI	nonsteroidal anti-inflammatory
NSI	Nutrition Screening Initiative
O ₂	oxygen
OASIS	Outcome Assessment Information Set
OBRA	Omnibus Budget Reconciliation Act
OBS	organic brain syndrome
OCD	obsessive compulsive disorder
od	once a day
OD	right eye
OD	overdose
OGTT	oral glucose tolerance test
OOB	out of bed
ORYX	The Next Evolution in Accreditation
OS	left eye
osm	osmole
OT	occupational therapy
OTC	nonprescription
OTC	over the counter

Abbreviation	Meaning	Abbreviation	Meaning
OU	both eyes	RAI	resident assessment instrument
oz	ounce	RBC	red blood cell
		RBP	retinal binding protein
P	phosphorus	RD	registered dietitian
PAB	prealbumin	RDA	recommended dietary allowances
pc	after meals	re	regarding
PCM	protein-calorie malnutrition	REE	resting energy expenditure
PD	peritoneal dialysis	RQ	respiratory quotient
PEG	percutaneous endoscopic gastrostomy	RRT	renal replacement therapy
PEJ	percutaneous endoscopic jejunostomy	RUG	resource utilization group
PEM	protein-energy malnutrition		
PI	performance improvement	s	without
PICC	peripherally inserted central catheters	S/P	status post
PM	afternoon	SC	subcutaneous
PN	parenteral nutrition	SDAT	senile dementia of the Alzheimer's type
po	by mouth (per os)	SNF	skilled nursing facilities
postop	postoperative, after surgery	SOB	shortness of breath
PPN	peripheral parenteral nutrition	soln	solution
PPO	preferred provider organization	SOS	if necessary
PPS	prospective payment system	spec	specimen
preop	preoperative, before surgery	SR	sustained release form
prep	preparation	SS	soapsuds
prn	as necessary	stat	immediately or at once
Pro	protein	susp	suspension
PSE	postal systemic encephalopathy		
pt	pint	T	tablespoon
Pt	prothrombin time	T Pro	total protein
PT	physical therapy	tab	tablet caplet
PTH	parathyroid hormone	temp	temperature
PUD	peptic ulcer disease	TF	tube feeding
PUSH	Pressure Ulcer Scale for Healing	TG	triglycerides
PVD	peripheral vascular disease	Thi	thiamin
PVI	peripheral vascular insufficiency	TIA	transient ischemic attacks (small strokes)
pwd	powder	TIBC	total iron binding capacity
Pyr	pyridoxine (vitamin B ₆)	tid	three times daily
		TLC	total lymphocyte count
q	every	TPN	total parenteral nutrition
q4h	every 4 hours	TPR	temperature, pulse, respiration
QA	quality assurance	TQM	total quality management
qd	every day	tsp	teaspoon
qh	every hour		
qhs	every night at bed	UBW	usual body weight
QI	quality improvement	URI	upper respiratory infection
qid	4 times daily	USRDA	United States Recommended Dietary Allowance
qod	every other day	UTI	urinary tract infection
qt	quart		

Abbreviation	Meaning
via	by way of
Vit	vitamin
VLDL	very-low-density lipoprotein
VO	verbal order
VS	vital signs
w/c	wheelchair
WBC	white blood cell
wk	week
WNL	within normal limits
wt	weight
×	times
yr or y	year
Zn	zinc
g	microgram
-	negative
+	positive
>	greater than
<	less than
↓	low, decrease
↑	high, increase
°	degree

Documentation Guidelines

Federal Interpretive Guideline 483.20(c) states that the accuracy of the assessment means the appropriate, qualified health professional correctly documents the client's medical, functional, and psychosocial problems, and identifies the client's strengths to maintain or improve medical status, functional abilities, and psychosocial status. The initial comprehensive assessment provides the baseline data for ongoing assessments of client progress. The registered dietitian is the recognized professional for the nutrition care of the client. Therefore, it is important that the registered dietitian who is employed on a part-time or consultant basis work closely with and train the dietetic technician or dietary manager to collect and record appropriate data for the completion of the client comprehensive assessment, to prepare effective care plans, and to document any other pertinent client information in the medical chart.

The assessment should paint a picture. Rather than "client has dysphagia," it should explain that "client has coughing, drooling, and pocketing." The assessment must be a comprehensive vehicle to track changes. It is the cornerstone for care planning.

Following are guidelines for effective documentation:

- Use black ink.
- Direct quotes from client should be included and identified.
- State only facts; avoid phrases such as "appears to be" or "seems to be."
- When entering data on a form with blocks or spaces for specific data, complete all spaces. Draw a line through all unused blank spaces in a line.
- Use standard, legally valid abbreviations to save time (see *Appendix 1*).
- Date all entries with month, day, year, and time.
- Sign all entries with full name and credentials.

- Do not obliterate anything on the record. If a mistake is made, line out the incorrect entry without rendering it illegible, sign and date the correction, then enter the correct data. This is important because the medical record may be subpoenaed as legal evidence.
- Document the indications for nutrition interventions.
- When noting a referral or a return visit on a specific day, use the date, not the day of the week.
- Document all pertinent facts immediately.
- Do not backdate any medical records; it is illegal.
- Document teaching methods. Include what was taught, when the teaching occurred, what method was used, what techniques were used to ensure understanding of the material, and what the client's response was.
- Document lack of client compliance.
- Do not make uncomplimentary comments about the client or a member of the client's family in the medical record. Clients have access to charts.
- Any discussion of problems, concerns, and so forth with the client, the client's family, or another member of the health care team should be recorded.
- Do not criticize prior care or record-keeping of other health care professionals.
- Make sure documentation is complete, accurate, legible, informative, and timely.
- All documentation is to be completed on the premises; it is never to be taken to a different location for completion.

Finally, keep in mind, "If it's not recorded, it's not done or it didn't happen."

3

APPENDIX

Commonly Prescribed Drugs and Over-the-Counter Medications

Antibiotics												
Metronidazole (Antibacterial, Antiprotozoal) <i>Flagyl</i>	↓C		C		R	✓	C	C		R	✓	Low: WBC, platelets (R)
Additional Side Effects/Warnings: Numbness of an extremity, dizziness, furry tongue, inflammation of tongue/mouth, oral infection, ↓coordination, depression, confusion, fever, altered ECG. Problems w/blood cell formation. May interfere w/determining blood chemistries: AST/SGOT, ALT/SGPT, LDH, TG. Inactive ingredient: 322 mg Na in 1 RTU IV 100 mL single-dose container.												
Nutritional Actions To Take/Monitoring Recommendations: May need fluid & electrolyte replacement if liquid stools. May need protein supplements. Monitor WBC w/dif before & after drug therapy.												

Drug		Side Effects											Alteration in Labs									
CODES		Appetite Changes	Weight Changes	Edema	Altered Taste	Thirst	Dry Mouth	↑Risk Dental Problem	Heartburn/GI Pain	Nausea/Vomiting	Diarrhea	Constipation	Blood Pressure Changes	Drowsy/Weak	Take With Food	Avoid Caffeine	Avoid Alcohol	Highly Protein - Bound	Liver Damage	Glucose Altered	Lytes	Other Labs
C = Common side effect R = Rare side effect ✓ = Precaution/indicated ↑ = Increase ↓ = Decrease																						
GENERAL CLASS (CONT)																						
Antibiotics (cont)																						
Cefaclor (Antibiotic) Cecfor									R	R	R								R			Low: platelets, WBC, Hgb, HCT High: PT, SGOT, SGPT, LDH, GGT, alk phos, bili, BUN, creat
Additional Side Effects/Warnings: Antibiotic assoc diarrhea (pseudomembranous colitis). False+ urine glu w/CuSO4 (Clinitest). Use Clinitest or Tes-Tape to check urine glu. Impairs metab of Vit K. Rare: dizziness, oral infection, problems w/blood cell formation, ↓neutrophils, hemolytic anemia, aplastic anemia, renal problems. Allergic angioedema: risk airway obstruction.		Nutritional Actions To Take/Monitoring Recommendations: If pseudomembranous colitis is suspected, check stool for C difficile or its toxin. If ↑PT, may need to ↑Vit K in diet or suppl. Monitor PT, CBC w/dif, liver & renal function w/LT use.																				
Tetracycline HCL (Antibiotic) Achromycin-V, Sumycin, Tetracycline		↓						✓	C	C	C	C							R	↓		Low: B-6, B-12, pantothenic acid High: alk phos, BUN, amylase, bili, SGOT, SGPT
Additional Side Effects/Warnings: Difficulty swallowing, oral infection, inflammation of mouth, ↓muscle coordination. ↓absorp amino acids. Combines w/Ca, Mg, Fe, Zn: ↓absorp of drug & mineral. ↑urinary loss Rib, Fol. Poss ↓Vit K, B def w/LT use. Poss hematologic abnormalities. Inactive ingredient: lactose.		Nutritional Actions To Take/Monitoring Recommendations: Take 3 hr separate from drug: dairy prod, Ca, Mg, Fe, Zn, MVI w/min. Not w/Al, Ca, Mg suppl or antacids. Stop t fdg 1 hr before & 2 hr after drug. ↑Rib, Fol, B-6, B-12. Monitor DM.																				
Anticoagulants																						
Warfarin Sodium (Anticoagulant) Coumadin								✓	R	R	R						✓	✓	✓	R		Low: clotting factors, WBC High: PT, SGOT, SGPT, alk phos, bili
Additional Side Effects/Warnings: Risk internal or ext bleed, fever, dead skin tissue, gangrene. Risk GI ulcer/bleed/Fe def anemia. ↑Vit K intake will ↓drug effect. ↓Vit K intake will ↓ PT. Inactive ingredients: lactose, starch.		Nutritional Actions To Take/Monitoring Recommendations: Consistent Vit K intake. Caution w/Vit K suppl or MVI. Avoid these herbal teas/remedies: horse chestnut, buckeye (aesculus), tonka beans, melilot & woodruff. Avoid GI irritants (eg, K+ suppl, pepper, caffeine, alcohol w/LT use. Avoid high-dose Vit A. Not >400 IU Vit E/d. Not >500 mg Vit C/d; may ↑↑drug absorp. Vit K in t fdgs is drug antagonist: adjust dose, monitor PT; change t fdg. Monitor PT &/or INR weekly. Monitor alb.																				

Drug	Side Effects												Alteration in Labs								
CODES C = Common side effect R = Rare side effect ✓ = Precaution/indicated ↑ = Increase ↓ = Decrease	Appetite Changes	Weight Changes	Edema	Altered Taste	Thirst	Dry Mouth	↑Risk Dental Problem	Heartburn/GI Pain	Nausea/Vomiting	Diarrhea	Constipation	Blood Pressure Changes	Drowsy/Weak	Take With Food	Avoid Caffeine	Avoid Alcohol	Highly Protein - Bound	Liver Damage	Glucose Altered	Lytes	Other Labs
GENERAL CLASS (CONT)																					
Antidiabetics (cont)																					
Glipizide (Oral Hypoglycemic) Glucotrol, Glucotrol XL																					
Additional Side Effects/Warnings: Caution w/↑ dose nicotinic acid: ↑glu. ↑blood levels of drug w/renal or liver disease cause ↑risk of ↓glu reaction and prolonged ↓glu. Problems w/blood cell formation, hemolytic anemia, aplastic anemia, ↓neutrophils causing ↑risk of infection, ↓drug effectiveness w/LT use. Inactive ingredient: lactose.																					
Nutritional Actions To Take/Monitoring Recommendations: Diet important. If SIADH: ↓blood Na, may need fld restr. Monitor wt, blood/urine glu, glycosylated Hgb, alb, Na, renal/liver function.																					
Low: Na High: BUN, creat, SGOT, alk phos, LDH																					
Glyburide (Oral Hypoglycemic) DiaBeta, Glynase PresTab, Micronase																					
Additional Side Effects/Warnings: Risk heart problems, blurred vision, problems w/blood cell formation, ↓neutrophils causing ↑risk of infection, hemolytic anemia, aplastic anemia. Caution w/high-dose nicotinic acid: ↑glu. Inactive ingredient: lactose.																					
Nutritional Actions To Take/Monitoring Recommendations: Diet compliance important. SIADH: ↓blood Na, may need fld restr. Monitor wt, blood/urine glu, glycosylated Hgb, alb, wt, liver/heart function.																					
Low: Na Low: platelets High: LDH, BUN, creat, SGOT, SGPT, alk phos																					
Metformin (Antihyperglycemic) Glucophage																					
Additional Side Effects/Warnings: Decreases hepatic glu production, intestinal absorption of glucose and serum lipids. Increases peripheral glucose uptake. Does not cause hypoglycemia. Megaloblastic anemia (R) and lacticacidosis. Caution with ↓renal function.																					
Nutritional Actions To Take/Monitoring Recommendations: Diet important. Monitor glu and glycosylated Hgb.																					
Tolbutamide (Oral Hypoglycemic) Orinase																					
Additional Side Effects/Warnings: Rare problems w/blood cell formation. Inactive ingredient: lactose.																					
Nutritional Actions To Take/Monitoring Recommendations: Diet important. Risk SIADH: ↓blood Na: may need fld restr. Monitor blood/urine, glu, glycosylated Hgb, alb, liver function.																					
Low: Na High: SGOT, SGPT, alk phos, LDH, BUN, creat																					
Troglitazone (Antihyperglycemic) Rezulin																					
Additional Side Effects/Warnings: Dizziness, potential infection, UTI, pain, pharyngitis.																					
Nutritional Actions To Take/Monitoring Recommendations: Diet important. May need ↓Na, ↓Kcal diet. Monitor glu, glycosylated Hgb, Hct, WBC, lipids, LFTs. See Na guideline.																					
Low: Hgb, Hct, WBC, TG High: LDL, HDL, chol, SGOT, SGPT, alk phos, bili																					

Drug	Side Effects														Alteration in Labs							
CODES C = Common side effect R = Rare side effect ✓ = Precaution/indicated ↑ = Increase ↓ = Decrease	Appetite Changes	Weight Changes	Edema	Altered Taste	Thirst	Dry Mouth	↑Risk Dental Problem	Heartburn/GI Pain	Nausea/Vomiting	Diarrhea	Constipation	Blood Pressure Changes	Drowsy/Weak	Take With Food	Avoid Caffeine	Avoid Alcohol	Highly Protein - Bound	Liver Damage	Glucose Altered	Lytes	Other Labs	
ANTINEOPLASTIC AGENTS (CONT)																						
Methotrexate Na (Antiarthritic, Antineoplastic) <i>Rheumatrex</i>	↓C	↓C		R			✓		C	C			C				✓		✓		Low (C): WBC, platelets, alb Rare Low: HCT Urine: ↑uric acid (C) High (C): uric acid, SGOT, SGPT, bili, BUN	

Additional Side Effects/Warnings:

Folate antagonist. Folate suppl may ↓responsiveness to drug. Folate def may ↑drug toxicity. May ↓absorp of fat, Vit B-12, Ca. Common: Inflammation of gums/mouth/pharynx, bone marrow depression, ↓resistance to infection, anemia, dizziness, fever. Rare: blood in emesis, GI ulcer/bleed, enteritis, ↓vision, confusion, ↓coordination, ↑sweating, pulmonary & renal disease.

Nutritional Actions To Take/Monitoring Recommendations:

Maintain adeq hydration to ↑urine output. Monitor for toxicity, CBC w/dif, platelets, alb, liver & renal function. See hydration, anemia, fol, Vit B-12, Ca guidelines.

Vinblastine Sulfate (Antineoplastic) Velban	↓							R	R	R	C	↑	✓									Low: WBC
--	---	--	--	--	--	--	--	---	---	---	---	---	---	--	--	--	--	--	--	--	--	----------

Additional Side Effects/Warnings:

Alopecia, anemia, ileus, leukopenia, pain, thrombocytopenia.

Nutritional Actions To Take/Monitoring Recommendations:

May need ↑fiber, ↑fluids. Monitor WBC. See fiber, hydration guidelines.

CARDIOVASCULAR AGENTS**Antiarrhythmics**

Digitalis, Digoxin (<i>Crystodigin, Digoxin</i>) Digoxin (<i>Digoxin, Lanoxin</i>) (Antiarrhythmic)	↓										C	C		R			✓					↑↓K+ Low: Mg, Zn
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Additional Side Effects/Warnings:

Heart problems, blurred vision, confusion, depression. Anorexia & nausea may result in digitalis cachexia w/high-dose tx. Mg suppl may ↓absorp of drug. These ↑risk of digitalis toxicity: renal problems, ↓blood K⁺, ↑blood Ca, ↓blood Mg. Caution w/concurrent use of laxative, risk ↓blood K⁺, ↑glu, irregular heart beat & drug toxicity. May contain 1 or more of these inactive ingredients: lactose, sucrose, alcohol.

Nutritional Actions To Take/Monitoring Recommendations:

Take 1 hr before or 2 hr after ↑bran fiber, pectin foods or bulk laxative. May need ↓Na diet. ↑K⁺ intake. Adequate Mg & Ca intake. Caution w/Vit D suppl: high blood Ca may cause irregular heart beat. Avoid these herbal teas/remedies: foxglove, dogbane, lily-of-the-valley & oleander: these have digitalis-like action & may cause digitalis toxicity. No licorice. Monitor wt, alb, Ca, Mg, lytes, renal function & serum drug levels. Osmolarity = 1350 (liquid).

Propranolol HCL (Antianginal) Inderal, Inderal LA						R							↓	C	✓		✓	✓	↑↓			High: K Low: T3 High: SGOT, SGPT, alk phos, LDH
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Additional Side Effects/Warnings:

↓coordination, depression, visual disturbances, confusion. Problems w/blood cell formation, ↓neutrophils causing ↑risk of infection. Pts w/DM: may mask ↓glu symptoms of rapid heart beat, but dizziness & sweating w/↓glu may still be manifested. May prolong ↓glu. May ↓insulin response to ↑glu. Inactive ingredient: lactose.

Nutritional Actions To Take/Monitoring Recommendations:

May need ↓Na, ↓Kcal diet. No licorice. Take Ca suppl separate: Ca suppl may ↓absorp. Hypoglycemia w/t fdg. Monitor BP, alb, liver/renal function, DM.

Drug		Side Effects												Alteration in Labs								
CODES		Appetite Changes	Weight Changes	Edema	Altered Taste	Thirst	Dry Mouth	↑Risk Dental Problem	Heartburn/GI Pain	Nausea/Vomiting	Diarrhea	Constipation	Blood Pressure Changes	Drowsy/Weak	Take With Food	Avoid Caffeine	Avoid Alcohol	Highly Protein - Bound	Liver Damage	Glucose Altered	Lytes	Other Labs
CARDIOVASCULAR AGENTS (CONT)																						
Antihyperlipidemics																						
Cholestyramine (Antihyperlipidemic) <i>Questran, Questran Light</i>		↓	↑↓						C	C	R	C		✓							Low: K, Na High: Cl	Low: Ca, Chol, LDL, T4, Folic Acid High: PPT, HDL Transient High: TG, alk phos, SGOT, SGPT
Additional Side Effects/Warnings: Risk GI ulcer/bleed/Fe def anemia. Risk fecal impaction. May ↓absorp fat, MCT, Ca, Mg, Fe, Zn, Fol, B-12, glu, fat-soluble vitamins (A, D, E, K); fatty stools, soft bones. Vit K def may cause ↑bleeding tendency. Inactive ingredients: some forms of sucrose, phenylalanine.		Nutritional Actions To Take/Monitoring Recommendations: Never take powder drug in dry form. Mix w/2-6 oz liquid or high-moisture pulpy fruit such as applesauce. Take vit suppl 1 hr before or 4 hr after drug. May need ↓fat, ↓Chol, ↓Kcal diet. ↑fiber, ↑fluids. May need Vit A, D, E, K, B-12, Fol suppl. Monitor wt, hydration, Chol, TG, PT, Ca, lytes.																				
Lovastatin (Antihyperlipidemic) <i>Mevacor</i>		↓			R	R			C	C	C	C			✓		✓		C			Low (C): Chol, TG, LDL, VLDL Low (R): WBC, platelets High (c): SGPT, SGOT, CPK, HDL High (R): alk phos, bili
Additional Side Effects/Warnings: Blurred vision. Not w/↑dose Nia suppl: muscle weakness/pain. Rare fever, problems w/blood cell formation, hemolytic anemia, tremor, depression, angioedema (risk difficulty swallowing/airway obstruction). Inactive ingredients: lactose, starch.		Nutritional Actions To Take/Monitoring Recommendations: May need ↓fat, ↓chol, ↓Kcal diet. ↑fiber, ↑fluids. Take fiber, pectin, oat bran 3 hr separate. Monitor liver function prior to drug & freq after starting drug. Monitor chol, CPK.																				
Hypotensives																						
Clonidine HCL (Antihypertensive) <i>Catapres</i>		↓	↑	R		C	✓			C		C		↓	C		✓		R	R↑		High: SGOT, SGPT
Additional Side Effects/Warnings: Suppresses signs of ↓glu w/DM. Inactive ingredient: lactose.		Nutritional Actions To Take/Monitoring Recommendations: May need ↓Na, ↓Kcal diet. No licorice. Caution w/Nia suppl: ↑vasodilating & ↓BP. Monitor wt, BP, DM.																				
Diuretics																						
Furosemide (Antihypertensive, Diuretic, Loop K-depleting) <i>Lasix</i>		↓	↓			R			R	R	R	R		↓	R	✓		✓	R	↑		Low: K, Na, Cl High: BUN, creat, uric acid, Chol, LDL, BLCL, TG
Additional Side Effects/Warnings: Oral/GI irritation, blurred vision. ↑urinary loss of Ca, Mg, K+, Na, Cl, Cr, Zn. Problems w/blood cell formation. ↓neutrophils causing ↑risk of infection (R). Aplastic anemia (R), hemolytic & other anemias, fever. Wt ↓ may reflect water loss due to diuretic action of drug. May contain 1 or more of these inactive ingredients:		Nutritional Actions To Take/Monitoring Recommendations: May need ↓Na, ↓Kcal diet. ↑K+, ↑Mg intake, may need K+ or Mg suppl. No licorice. Monitor wt, BP, hydration, lytes, Mg, Ca, alb, glu, uric acid, CO ₂ , renal function. Osmolarity = 2050 (solution).																				

Drug	Side Effects																	Alteration in Labs				
CODES C = Common side effect R = Rare side effect ✓ = Precaution/indicated ↑ = Increase ↓ = Decrease	Appetite Changes	Weight Changes	Edema	Altered Taste	Thirst	Dry Mouth	↓Risk Dental Problem	Heartburn/GI Pain	Nausea/Vomiting	Diarrhea	Constipation	Blood Pressure Changes	Drowsy/Weak	Take With Food	Avoid Caffeine	Avoid Alcohol	Highly Protein - Bound	Liver Damage	Glucose Altered	Lytes	Other Labs	
CARDIOVASCULAR AGENTS (CONT)																						
Diuretics (cont)																						
Spironolactone (Diuretic)		↑																			Low: Na, Cl High: acid K+ (esp w/t fdg)	High: BUN, creat, Mg, uric acid
Aldactone					C	C		C	C	C		↓	R	✓				✓				

Additional Side Effects/Warnings:

Dehydration, fever, ↓coordination. Risk GI ulcer/bleed/Fe-def anemia. Caution w/ESRD. Wt ↓ may reflect water loss due to diuretic action of drug.

Nutritional Actions To Take/Monitoring Recommendations:

May need ↓Na, ↓Kcal diet. Adequate hydration. No licorice. Avoid ↑K+ intake. No K+ suppl. No salt subs w/K+. No ↓Na milk. Monitor wt, BP, hydration, lytes, alb, renal function.

Maxzide (Antihypertensive, Diuretic)																						
Triamterene & Hydrochlorothiazide	↓	↓		✓	R	R		✓	R	R	R	↓	R	✓					↑		High: K+ (C) Low: Na, Cl, K+ (R)	Low: Mg, Bicarb, Fol, PBI, Phos, WBC, platelets High: BUN, creat, uric acid, Ca, bili, Chol, TG, LDL

Additional Side Effects/Warnings:

Fol antagonist, megaloblastic anemia. Problems w/blood cell formation, ↓neutrophils causing ↑risk of infection, aplastic anemia, hemolytic anemia. Renal problems, GI irritation, depression, fever, blurred vision. ↓urinary loss Ca: caution w/Ca or Vit D suppl. Wt ↓ may reflect water loss due to diuretic action of drug.

Nutritional Actions To Take/Monitoring Recommendations:

May need ↓Na, ↓Kcal diet. No licorice. ↑Mg intake. May need Mg suppl. No salt subs w/K+. No ↓Na milk. Monitor blood K+ for ↑K+ (C) or ↓K+, then adjust K+ intake if needed. Edema w/↓blood Na may need fld restr. If frank Na depletion, replete Na. Monitor wt, hydration, BP, DM, lytes, Mg, BUN, uric acid, CBC w/dif, platelets, renal function.

GASTROINTESTINAL AGENTS**Antacids**

Aluminum Hydroxide & Magnesium Hydroxide (Antacid) <i>Aludrox, Di-gel, Gelusil, Maalox, Maalox Plus, Mylanta, Mylanta Double-Strength</i>																						
																					Low: K	Low: Phos High: Mg w/LT use, Al w/LT use w/ESRD

Additional Side Effects/Warnings:

↓absorp Vit A, Fol, Phos, Fe, Rib, Cu. Inactivates Thi. Not w/ESRD: ↑Mg and ↑Al w/LT use. May cause brain dysfunction & harm to nerves. Caution in dialysis patients, may cause osteomalacia and dementia w/LT use. May contain 1 or more of these inactive ingredients: mannitol, saccharin, sorbitol.

Nutritional Actions To Take/Monitoring Recommendations:

Take citrus fruit/juice 3 hr sep. ↑Vit A, Fol, Fe, Rib. May need Fol suppl w/LT use. Take Vit A, Fol, Fe, Rib, Thi suppl 2 hr sep. Adeq Ca intake to avoid soft bones. Monitor Phos, Ca, Mg, K+.

Drug	Side Effects													Alteration in Labs							
CODES	Appetite Changes	Weight Changes	Edema	Altered Taste	Thirst	Dry Mouth	↑Risk Dental Problem	Heartburn/GI Pain	Nausea/Vomiting	Diarrhea	Constipation	Blood Pressure Changes	Drowsy/Weak	Take With Food	Avoid Caffeine	Avoid Alcohol	Highly Protein - Bound	Liver Damage	Glucose Altered	Lytes	Other Labs
C = Common side effect R = Rare side effect ✓ = Precaution/indicated ↑ = Increase ↓ = Decrease																					
GASTROINTESTINAL AGENTS (CONT)																					
Antidiarrheals																					
Diphenoxylate HCL w/Atropine Sulfate (Antidiarrheal) Lomotil	↓		✓			R		C	R	R	C	↓	C	✓	✓						
Additional Side Effects/Warnings: Dry mouth, nose & throat. Sore, swollen gums, ↑sweating, blurred vision, confusion, depression, tremor, ↓coordination, risk toxic megacolon. Problems w/blood cell formation, ↓neutrophils causing ↑risk of infection, hemolytic anemia.											Nutritional Actions To Take/Monitoring Recommendations: Do not give w/pseudomembranous colitis (post antibiotic diarrhea w/stool + C difficile). Not w/dysentery: blood in stools and fever. Replace fluid & lytes as needed w/diarrhea. Monitor hydration, lytes, BP, alb. Osmolarity = 8800.										
Loperamide HCL (Antidiarrheal) Imodium, Imodium AD						R		R	R	R	R		R		✓						
Additional Side Effects/Warnings: Caution w/child: may mask dehydration or lyte imbalance. May contain 1 or more of these inactive ingredients: lactose, alcohol.											Nutritional Actions To Take/Monitoring Recommendations: Not w/pseudomembranous colitis (post-antibiotic diarrhea & stool + C difficile). Not w/dysentery: blood in stools & fever. Replace fluid & lytes as needed w/diarrhea. Monitor hydration, lytes.										
Cathartics																					
Psyllium (Laxative) Fiberall, Metamucil, Perdiem Fiber	↓							R	R	R											Low: Chol, LDL
Additional Side Effects/Warnings: ↓Rib absorp. Caution w/DM: some forms contain sugar. Not w/difficulty swallowing. If taken w/inadeq fld, may swell, block throat & cause choking. May contain 1 or more of these inactive ingredients: sucrose, dextrose, aspartame, Na, K+, wheat bran.											Nutritional Actions To Take/Monitoring Recommendations: Take w/>8 oz fluid. ↑fiber, ↑fluids. ↑Rib intake. Monitor hydration.										
Docusate Sodium (Laxative, Stool Softener) Colace, Dialose				C				R	C	R									↑		Low: K
Additional Side Effects/Warnings: Throat irritation (C). ↓absorp water & lytes. May contain 1 or more of these inactive ingredients: sucrose, alcohol, starch, sodium.											Nutritional Actions To Take/Monitoring Recommendations: ↑fiber, ↑fluids. Monitor K+, hydration, DM.										

Drug	Side Effects	Alteration in Labs
CODES C = Common side effect R = Rare side effect ✓ = Precaution/indicated ↑ = Increase ↓ = Decrease	Appetite Changes Weight Changes Edema Altered Taste Thirst Dry Mouth ↓Risk Dental Problem Heartburn/GI Pain Nausea/Vomiting Diarrhea Constipation Blood Pressure Changes Drowsy/Weak Take With Food Avoid Caffeine Avoid Alcohol Highly Protein - Bound Liver Damage Glucose Altered	Lytes Other Labs
GASTROINTESTINAL AGENTS (CONT)		
H2 Inhibitors (Gas)		
Cimetidine HCL (Antisecretory, Antiulcer, H2 Antagonist)		
Tagamet (liquid) , Tagamet HB		

Nutritional Actions To Take/Monitoring Recommendations:

Take Fe suppl 1 hr before drug. Take Ca or Mg suppl separate by 1 hr. May need bland diet. Monitor BP, liver functions. **See caffeine guideline.**

Additional Side Effects/Warnings:

↓ Vit B-12 absorp. ↑ need Vit D. Liq precipitates t fdg. ↓ gastric acid secretions. Caution w/LT use w/elderly: poor chewing and/or ↑ fiber intake may cause food balls in stomach. May contain 1 or more of these inactive ingredients: starch, alcohol, sorbitol, saccharin.

[illegible]

Additional Side Effects/Warnings:

Additional Side Effects/Warnings:
 ↓Vit B-12 absorb. Rare ↓vision, confusion, depression, problems w/blood cell formation, ↓neutrophils causing ↑risk of infection, aplastic anemia, hemolytic anemia. ↓gastric acid secretions. Caution w/LT use w/elderly: poor chewing and/or ↑fiber intake may cause food balls in stomach. May contain 1 or more of these inactive ingredients: alcohol, saccharin, sorbitol, coconut oil, aspartame. Granules contain 174 mg Na/pkt.

Nutritional Actions To Take/Monitoring Recommendations:

May need bland diet. ↑ Vit B-12 intake. May need +B-12 suppl w/LT use. Take Vit B-12 suppl separate. Monitor hydration, liver function.

PSYCHOTHERAPEUTIC AGENTS

[illegible]

Additional Side Effects/Warnings:

Depression, ↓ coordination, blurred vision, ↑ saliva, EPS (eg, difficulty swallowing, protrusion of tongue, drooling, tremors, abnormal involuntary movements).
Problems w/ blood cell formation (R). Lg, ↑ fiber, ↑ fat meals = delayed gastric emptying in stomach, less unchanged drug avail for absorption in intestine. Inactive ingredients: alcohol, ethyl & benzyl alcohol.

Nutritional Actions To Take/Monitoring Recommendations:

Limit caffeine to <500 mg/d. Monitor BP, alb, CBC w/dif, liver function w/use >4 weeks.

Drug		Side Effects													Alteration in Labs							
CODES C = Common side effect R = Rare side effect ✓ = Precaution/indicated ↑ = Increase ↓ = Decrease		Appetite Changes	Weight Changes	Edema	Altered Taste	Thirst	Dry Mouth	↑Risk Dental Problem	Heartburn/GI Pain	Nausea/Vomiting	Diarrhea	Constipation	Blood Pressure Changes	Drowsy/Weak	Take With Food	Avoid Caffeine	Avoid Alcohol	Highly Protein - Bound	Liver Damage	Glucose Altered	Lytes	Other Labs
PSYCHOTHERAPEUTIC AGENTS (CONT)																						
Lithium Carbonate (Antimanic) Eskalith, Lithobid, Lithonate, Lithotabs		↓	↑↓	C	C	C	C	✓	C	C	C		→	C	✓	✓	✓			↑		Low: T4, T3 High: Ca, Phos, Mg, PTH, WBC, platelets, TSH

Additional Side Effects/Warnings:

Renal problems, dehydration, fine hand tremor, muscle weakness, ↓coordination/rigidity, abnormal involuntary movements, blurred vision, confusion, tongue movements, ↑saliva, incontinence of urine/feces, fever. Angioedema: risk difficulty swallowing or airway obstruction. Syrup precipitates t fogs. Avoid iodine suppl: ↑risk hypothyroidism. May contain 1 or more of these inactive ingredients: lactose, benzyl alcohol, tartrazine.

Nutritional Actions To Take/Monitoring Recommendations:

Adeq hydration (2.5-3 L fld/d). Consistent Na intake stabilizes drug levels. Avoid iodine suppl due to ↑risk of hypothyroidism. Separate syrup from t fdg. Monitor wt, hydration, lithium levels, WBC w/dif, Na, Ca, Phos, DM, thyroid/renal. Osmolality = 6850 (syrup).

MAO Inhibitors																						
Phenelzine Sulfate (Antidepressant, MAOI) <i>Nardil</i>		↑	↑	C			C		C	R		C	↑↓	C	✓	✓			R	↓	Rare: ↑↓Na	High: SGOT, SGPT

Additional Side Effects/Warnings:

Blurred vision, tremor, ↑sweating (R), fever (R), ↓coordination (R), problems w/blood cell formation (R), hypermetabolic syndrome (R), Vit B-6 def: damage to nerves in hands, feet. Inactive ingredients: mannitol, sucrose, wheat flour.

Nutritional Actions To Take/Monitoring Recommendations:

Avoid foods high in tyramine & other pressor amines. No tryptophan suppl. May need Vit B-6 suppl. If SIADH: ↓blood Na, may need fld Na, may need fld restr. Monitor wt, hydration, BP, DM, CBC w/dif, liver function.

Tranylcypromine Sulfate (Antidepressant, MAOI) <i>Parnate</i>		↑↓	↑	R			C		C	C	C	C	↑↓	C	✓	✓			R	↓	↑↓Na	Low: WBC, platelets, granulocytes High: CPK, SGOT, SGPT
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Additional Side Effects/Warnings:

Tremor, blurred vision, chills, fever, ↑sweating, anemia, problems w/blood cell formation. Inactive ingredients: lactose, starch.

Nutritional Actions To Take/Monitoring Recommendations:

Avoid foods high in tyramine & other pressor amines. No tryptophan suppl. If risk SIADH: ↓blood Na: may need fld restr. Monitor wt, BP, DM, hydration, CBC w/dif, liver function.

Phenothiazines																						
Thioridazine HCL (Antipsychotic) <i>Mellaril</i>		↑	↑	✓			C	✓		R	✓	C	↓	C	✓	✓	✓		✓	↑		Low: WBC High: SGOT, SGPT, bill, alk phos, prolactin, chol

Additional Side Effects/Warnings:

NMS, EPS, abnormal involuntary movements, ↓vision, problems w/blood cell formation, ↓neutrophils causing ↑risk of infection. Liquid precipitates t fdg. May contain 1 or more of these inactive ingredients: alcohol, sorbitol, sucrose, lactose, starch.

Nutritional Actions To Take/Monitoring Recommendations:

↑ Rib intake. Monitor wt, hydration, BP, alb, DM, CBC w/dif, liver function. Osmolality = 2050 (liquid).

Drug	Side Effects														Alteration in Labs							
CODES C = Common side effect R = Rare side effect ✓ = Precaution/indicated ↑ = Increase ↓ = Decrease	Appetite Changes	Weight Changes	Edema	Altered Taste	Thirst	Dry Mouth	↑Risk Dental Problem	Heartburn/GI Pain	Nausea/Vomiting	Diarrhea	Constipation	Blood Pressure Changes	Drowsy/Weak	Take With Food	Avoid Caffeine	Avoid Alcohol	Highly Protein - Bound	Liver Damage	Glucose Altered	Lytes	Other Labs	
	PSYCHOTHERAPEUTIC AGENTS (CONT)																					
	Phenothiazines (cont)																					
Amitriptyline HCL (Antidepressant) Elavil	↑	↑↓	R	R		R	✓	R	R	R	R	C	↓C	C	✓	✓	✓		R	↑↓		High: prolactin Rare High: SGOT, SGPT, alk phos

Additional Side Effects/Warnings:

↓coordination, tremors, abnormal involuntary movements of oral/facial/other muscles, ↑sweating, black tongue, ↑BP (R). Caution w/elderly: behavior agitation & interference w/eating. Problems w/blood cell formation. Inactive ingredient: lactose.

Nutritional Actions To Take/Monitoring Recommendations:

↑Rib intake. Rare risk SIADH: ↓blood Na, may need fld restr. Monitor wt, BP, hydration, alb, DM, liver function.

Antiparkinsonism																						
Levodopa (Antiparkinson) <i>Dopar, Larodopa</i>		↓	↑↓	R	C	C	C		C	C		R	↑↓	C	✓						Low: K+	Low: Hgb, HCT, WBC High: BUN, SGOT, SGPT, alk phos, LDH, bili

Additional Side Effects/Warnings:

↑saliva, difficulty swallowing, ↓coordination, confusion, depression, ↑sweating, blurred vision, hemolytic anemia, ↓neutrophils causing ↑risk of infection. Risk GI ulcer/bleed/Fe-def anemia. Drug & amino acids compete for absorp. High-dose Vit B-6 (10-25 mg/d) may ↓drug effects. May contain 1 or more of these inactive ingredients: tartrazine, lactose.

Nutritional Actions To Take/Monitoring Recommendations:

Not w/↑pro food, amino acids or protein hydrolysates. CHO-to-Pro ratio of 7:1 in diet may stabilize drug effects. Not w/↑fiber meal: slow emptying from stomach, more drug broken down in stomach & less unchanged drug avail for absorp intestines: erratic therapeutic response. Limit Vit B-6 to <5 mg/d. Take Fe suppl separate. Monitor wt, hydration, BP, CBC w/dif, liver/renal/heart function.

Adapted with permission from Pocket Resource for Nutrition Assessment, CDHCF Practice Group, 1988, and

Drug Nutrient Resource: Part of the Drug-Nutrient Intervention System, 3rd edition, Roche Dietitians, LLC, 1998, (708)442-0123.

INDEX

A

Accreditation Commission for Home Care, 38
 Acquired immune deficiency syndrome (AIDS), 63, 78, 87, 90, 91, 93, 94
 Adaptive eating aids, 214-215
 Adult day care, 13, 14, 17, 19
 Agency on Aging, 17-18
 Alanine aminotransferase, 81, 82
 Albumin, 78, 79, 129, 159, 185
 Albumin:globulin ratio, 89-91
 Alcohol (alcoholism), 85, 92, 94, 103, 105, 182
 Alcohol abuse, 70, 103
 Alcoholic liver disease (ALD), 63, 70
 Alkaline phosphatase, 81, 82
 Alternative medicine, 105, 108
 Alzheimer's disease, 30, 64, 65, 73, 182
 Ambulatory care, 13, 14, 17
 American Medical Directors Association, 70
 Anemia, 87, 91, 125-126
 Angina pectoris, 58
 Anorexia, 15, 61, 176
 Anthropometrics (anthropometry), 159, 180, 192
 Aspartate aminotransferase, 81, 82
 Assisted Living Quality Coalition, 16

B

Balanced Budget Act, 1
 Basal energy expenditure (BEE), 203-204
 Basal metabolic rate (BMR), 159
 Basal metabolism, 159
 Benchmark, 40
 Blood urea nitrogen (BUN), 78, 82-83, 84, 94, 95, 126, 128, 129, 131, 185
 Body mass index (BMI), 55, 56, 65, 179, 180, 182, 196-197
 Braden Scale, 168-169

C

CAGE questionnaire, 70
 Cancer, 61, 63, 69, 70, 71, 85, 90, 133, 153, 183, 205
 Care plan, interdisciplinary, 220
 Capitation, 2, 4, 5

Certified Diabetes Educator, 29
 Cholesterol, 58-59, 79, 81, 93, 129, 183, 185
 Chronic obstructive pulmonary disease (COPD), 60-61, 62, 70, 87, 153, 182
 Cirrhosis, 63, 87, 88, 90, 93, 94
 Code of Ethics, 25-26
 Commission on Accreditation/Approval for Dietetic Education, 21
 Commission on Dietetic Registration, 25
 Congestive heart failure, 59, 90, 94, 161, 182
 Congregate care, 13, 14
 Constipation, 71, 94, 159, 176
 Continuing care retirement centers, 14
 Continuous quality improvement, 9, 10, 37
 Coronary artery disease, 59
 Coronary heart disease, 55, 58, 81
 Creatinine, 78, 81, 84, 126, 128-129, 131
 Cystic fibrosis, 85, 92, 161, 163

D

Dementia, 30, 64, 94, 176
 Depression, 69, 70, 71-72, 133, 158, 176, 183
 DETERMINE Your Nutritional Health, 15, 18, 175, 176-177
 Diabetes, 9, 55, 56-57, 58, 59, 64, 69, 71, 72, 77, 79, 81, 83, 84, 85, 86, 94, 95, 159, 173, 183
 Dialysis, 123-124, 126-127
 hemo-, 126-127
 peritoneal, 127
 Dialysis Outcomes Quality Initiative, 128
 Diarrhea, 15, 70, 89, 91, 93, 103, 137, 139, 176, 182
 Dietary Interventions to Stop Hypertension (DASH), 58
 Dietetic practice groups, 41-43
 Dysphagia, 183, 210, 212-213

E

Eden Alternative, 49
 Enteral nutrition, 133-139
 Ethnic diets, 190-191

Extended care facilities, 15, 19, 69, 94, 210

F

Feeding tubes
 nasoenteric, 135, 139
 enterostomy, 135
 Folate, 85
 Food Acceptance Record, 176, 186
 Food Guide Pyramid, 18, 209
 Food Intake Record, 176, 187
 Formula
 predigested, 135
 polymeric, 135
 modular, 135
 selection of, 136

G

Glucose intolerance, 56
 Group homes, 13, 14, 19

H

Hamwi Formula, 198, 199
 Hand-over-hand assistance, 214
 Harris Benedict equation, 159, 160, 162, 163
 Health Care Financing Administration, 6, 15, 34, 39, 41, 50, 217, 222, 223
 Health maintenance organization (HMO), 4, 6, 9
 Health Plan Employer Data and Information Set (HEDIS), 41
 Healthy People 2000, 40, 68
 Hematocrit, 80, 86, 129, 159, 185
 Hemoglobin, 80, 87, 129, 159, 166, 185
 Hepatic disease, 62-63
 Herb therapy, 109-112, 113, 116
 High-density lipoprotein (HDL), 58, 81, 93-94
 Home care, 14, 17, 19, 33
 Home health agencies, 17, 18
 Homocysteine, 80, 87
 Human immunodeficiency virus, 63, 64, 92
 Hyperglycemia, 56, 57, 93, 104, 145
 Hyperkalemia, 104, 159
 Hyperlipidemia, 57, 58-59, 94, 127, 173

Hypertension, 57-58, 59, 62, 69, 70, 87, 94, 95, 123, 124, 173
 Hypoglycemia, 56, 104, 145
 Hypophosphatemia, 84, 161

I

Ideal body weight, 199, 200
 Indicator
 clinical, 43
 comparative rate based, 39-40
 outcome, 40
 process, 40
 sentinel event, 39
 structure, 40
 Insurance, malpractice, 32
 Interdisciplinary assessment team, 15
 Ireton Jones equation, 159, 160, 163

J

Jejunostomy tube, 134, 135
 Joint Commission on Accreditation of Healthcare Organizations, 31, 37, 38, 41, 118, 217

K

Krebs cycle, 161

L

Law of Torts, 29
 Leg ulcers, 173
 Lewin Group, The, 9, 19
 Longitudinal Study of Aging, 196
 Low-density lipoprotein (LDL), 93-94

M

Macronutrients, 140
 Malnutrition, 14, 15, 59, 61, 63, 94, 123-125, 127, 133, 153, 158, 159, 161, 166, 176, 183
 physical signs of, 193-194
 risk factors for, 192
 Malpractice, 29-31
 Managed care organization (MCO), 3, 7, 34
 Managed care terms, 5-9
 Mean corpuscular hemoglobin, 80, 90-91
 Mean corpuscular hemoglobin concentration, 80, 90-92
 Mean corpuscular volume, 80, 90-91
 Medical nutrition therapy (MNT), 1, 9, 10, 14, 16, 18, 19, 33, 39, 41, 43, 46, 53, 59, 61, 62, 63, 64, 77, 79, 123, 126, 163, 223
 Medical Outcomes Study, 34, 46
 Medicare, 1, 7, 9, 15

Methyl malonic acid, 80, 88
 Micronutrients, 141, 161
 Minimum Data Set (MDS), 16, 34, 219, 224-227
 Myocardial infarction (MI), 82, 83, 86, 93, 94

N

National Aging Services Network, 17
 National Center for Health Statistics, 196
 National Committee for Quality Assurance, 41
 National Library of Healthcare Indicators, 41
 Nausea, 15, 89, 103, 106, 108, 137, 176, 183
 Nutrition Assessment Form, 175, 184-185
 Nutrition Screening Initiative, 70, 175

O

Obesity, 55, 56, 57, 173, 192
 Older Americans Act Title III, 17
 Omnibus Budget Reconciliation Act of 1987, 49, 210, 217
 ORYX, 41
 Osteoporosis, 59-60, 70, 72, 183, 192
 Outcome Assessment Information Set (OASIS), 34, 35, 46, 49, 218
 Outcomes
 clinical, 33
 client/functional, 34
 cost, 37
 management, 7, 33, 37, 38

P

Parenteral nutrition, 133, 139-150
 peripheral, 15, 17, 18
 Performance improvement, 37, 38
 Performance measure, 39
 Pharmacokinetics, 99, 103
 PraPlus, 34, 35-36
 Prealbumin, 79, 89, 90, 159, 165, 183
 Preferred provider organization (PPO), 4, 8
 Pressor amines, 105-107
 Pressure ulcer, 44, 59, 165-170, 172
 healing chart, 172
 Prospective payment system (PPS), 217
 Protein-calorie malnutrition, 63, 76, 79, 85, 91, 93, 94, 123-124, 125
 Pulmonary function
 common medications, 158
 common terms, 157
 PUSH Scale, 171

Q

Quality of life, 34, 49, 53, 56, 209
 Quality assurance, 38
 Quality management, 37

R

r value, 195-196
 Rehabilitation Accreditation Commission, 38
 Renal osteodystrophy, 123, 124-125
 Resident Assessment Instrument (RAI), 16, 217, 218-219, 223
 Resident Assessment Protocol (RAP), 219-220, 223
 Resource utilization groups, 217
 Respiratory quotient, 161-162
 Resting energy expenditure (REE), 159-160
 Retinol binding protein, 92

S

SI units, 79
 Skilled nursing facility, 1, 2
 Standards of Practice, 26-28, 42
 Subacute care, 13, 14, 16, 33, 217

T

T-cells, 63
 Total iron binding capacity, 80, 87-88
 Total parenteral nutrition, 15, 17, 18, 36
 medical complications of, 146-150
 Total quality management, 9, 10, 38

U

Uremia, 125, 126

V

Ventilator-dependent, 161, 162
 Very-low lipoprotein, 93-94

W

Wheelchair-bound, 211-212



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